THE UNIVERSITY OF ALBERTA

AUDITORY ASPECTS OF READING READINESS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF EDUCATION

DIVISION OF ELEMENTARY EDUCATION

by

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EDMONTON, ALBERTA

April 1962

ABSTRACT

This study tested the auditory abilities of children entering the first grade and related the results of these auditory tests to oral and silent reading scores at the end of a grade one reading program. A comparison was also made of the auditory test results of boys and girls to determine whether auditory differences were affecting reading results.

The experimental group used were the one hundred twelve children entering the first grade at Gold Bar Elementary School, Edmonton, for the 1960-61 school term. Auditory memory and discrimination tests were administered at the beginning of the first grade reading program and again near its completion. Children who experienced difficulty with auditory memory and discrimination tests were checked by an auditory acuity sweep test and those who failed this were given individual audiometer tests. Oral reading was tested individually and silent reading by three group tests. Both oral and silent reading tests were standardized. Primary group intelligence tests were also used.

Testing revealed that although the boys were significantly older than the girls, intelligence levels for this group were equivalent. Significant differences in oral reading and in the silent reading tests of sentence and paragraph reading in favor of the girls were found. The silent reading scores of word recognition for boys and girls were not significantly different although the slight difference found was in favor of the girls.

Statistical correlation revealed that auditory memory is generally significant in its relationship with both oral and silent reading tests but auditory discrimination, especially as training and maturation affect it,

sometimes fails to reach significant relationship with reading tests. Auditory memory showed a much closer relationship with intelligence than auditory discrimination. Significant growth in auditory discrimination and memory was noted for boys and girls during the first year of school.

Although the girls did not have consistently higher mean scores on all auditory tests than boys, it appears possible that they begin reading with certain auditory advantages over the boys and apparently make more use of auditory abilities in learning to read. Delayed recall of auditorily related facts as measured by storytelling showed significantly higher scores for girls than boys but relationship with reading and intelligence appeared lower than the other auditory tests.

Individual audiometer testing revealed children with hearing loss and high acuity in the speech range among the children who failed the group sweep test for auditory acuity. It is possible that extreme acuity in hearing may be an auditory factor in learning due to frustration.

Further study at the primary level of auditory development, auditory memory training, high acuity, hearing loss and perceptual testing at the first grade level is suggested. The field of audition has considerable implication for the educational process.

ACKNOWLEDGEMENTS

The writer wishes to express appreciation for the cooperation and help of the grade one teachers at Cold Bar School, the assistance of Miss Jean Young in the individual testing and the help of Mr. Barry Mailloux in programming the statistics. Acknowledgement must also be made to the Edmonton Board of Health for the audiometric group test administration. The writer also wishes to acknowledge the advice and guidance given by Dr. Marion Jenkinson in planning and writing this thesis. Appreciation is also expressed to Miss Jean Dey and Mr. W. Brian Dockrell, the other members of the committee.

TABLE OF CONTENTS

CHAPTER PAGE

CHAPTER PAGE

CHAPTER PAGE

LIST OF TABLES

TABLE PAGE

CHAPTER I

THE PROBLEM

"A common misconception about the ability to hear is that it is wholly functional and ready to work as soon as it appears." Wepman (1960 - page 327). Research has proved that not only is hearing a learned activity but that it is also a developmental process.

Children begin school with widely varying degrees of auditory ability. Some children have extremely acute hearing while others can scarcely hear what is said to them in a normal tone. Some children with adequate hearing cannot discriminate between certain words or sounds, while still others experience no difficulty in hearing the likenesses or differences between words and sounds. Some children remember what they hear and can reproduce it accurately, others have little memory for words or sounds and at best reproduce a very inaccurate semblance of what is said.

The purpose of this study is to test the auditory abilities of children during their initial year of school and determine how these auditory abilities are related to the reading results obtained by testing at the conclusion of the grade one reading program.

HYPOTHESES

The following hypotheses will be tested in this study:

1. There will be a significant relationship between the scores on each of the tests of auditory memory and discrimination and the scores on oral and silent reading tests.

2. There will be significant relationship between the scores on each of the tests of auditory memory and discrimination and intelligence scores as measured by a standardized primary intelligence test.

3. There will be significant growth of both boys and girls in auditory memory and discrimination indicated by differences in the means of scores obtained on October and May administrations of the same tests for these abilities.

4. Girls will have significantly higher scores on each of the auditory tests of memory and discrimination than the boys and the girls' scores will show a higher relationship with oral and silent reading tests.

5. There will be a significant relationship between mental age as measured by a standardized primary intelligence test and the scores in oral and silent reading. However, when mental age and the scores for auditory memory and auditory discrimination are each correlated with the tests for oral and silent reading significance will prove to be greater than when mental age alone is used.

6. There will be some children with poor auditory acuity among the children who make low scores in auditory memory and these children will experience some difficulty in learning to read.

DEFINITION OF TERMS

1. Auditory ability in this study will include auditory acuity, auditory discrimination and auditory memory.

2. Auditory acuity will be defined as the ability to hear sound as tested by the use of a pure tone audiometer.

3. Auditory discrimination will be defined as the ability to

distinguish differences and likenesses of words and of sounds in words.

4. Auditory memory in this study will include the immediate recall of speech sounds and sentences and the delayed recall required in repeating story facts.

5. Auditory sentence memory span will be the ability to listen to a complete sentence and repeat it accurately.

6. Auditory fusion will be the ability to listen to speech sounds and fuse them into a word.

7. Auditory story memory will be the ability to listen to a story and retell basic facts from that story.

8. Phonic memory span will be the ability to listen to and then repeat unrelated speech sounds based on the phonetic elements taught in the first grade.

ORGANIZATION OF THE EXPERIMENTAL STUDY

In this study emphasis is being placed on auditory memory and discrimination rather than auditory acuity. However, there is a need for a thorough survey of a large number of children in the initial year of school to determine more about the developmental aspects of hearing acuity and its affect on learning to read.

It is proposed to administer a series of tests of auditory memory and discrimination to all pupils enrolled for the first year of school at the Gold Bar Elementary School. This group will consist of four and one half classrooms taught by five different teachers.

The individual tests of auditory memory and discrimination will be administered during the last week of September and the first two weeks in

October. A group test of auditory discrimination will also be administered to a randomly selected sample from the experimental group during October.

Auditory acuity will be checked the second week in February through use of a group audiometer sweep test given to forty children who secure low scores in auditory memory and discrimination or who are suspected of having hearing difficulty by their classroom teacher. Individual audiometer tests will be given to those children who experience difficulty on the audiometer sweep test.

The two group tests in intelligence used by the Edmonton Public School System in classifying grade one pupils will be used to determine intellectual level.

Further individual testing of auditory memory and discrimination will be carried on in May.

Individual tests of oral reading will also be administered in May. Results obtained from the group tests of silent reading given by the Edmonton Public School System will also be used to determine reading level.

All tests will be administered by the investigator, a graduate assistant, class room teachers and the audiometer operator from the Public Health Department.

The results will be programmed by the Computation Center at the University of Alberta and statistical analysis of the resulting data made by the investigator.

THE NEED FOR THIS STUDY

Although it is admitted that learning is to a large extent dependent upon auditory ability especially in the early grades little is actually known about how hearing develops.

Evidence of the developmental nature of hearing can be observed through study of the development of speech. Research shows that as auditory discrimination develops speech improves. Most of the final developmental aspects of speech take place during the first and second year of school. It is probable that most of the development of the auditory ability necessary to improve speech takes place during this same period. Testing at the first grade level may record this development.

Since research indicates that boys are slower in auditory development than girls and that boys encounter more difficulty in the initial processes of learning to read, further study of the differences between boys and girls might prove significant and useful. It is possible that knowledge of how boys and girls develop auditorily might aid in understanding how audition affects learning to read.

Statistics show that more boys than girls require remedial reading. It is possible that the fault lies not in the methods of instruction but in the timing and pacing of instruction. Auditory testing may aid in understanding the developmental aspects of audition and help us to give training when it is necessary.

Reading readiness and intelligence tests have been frequently used to make prognosis of reading success in the first grade. These

tests are efficient in determining visual discrimination, the ability of children to follow directions and make certain picture associations which require an adequate vocabulary for reading. However few of these tests make differentiations between visual and auditory abilities. It is possible that tests of auditory memory and auditory discrimination used in conjunction with an intelligence test might aid teachers in determining which children would need extra training in auditory discrimination and which need more repetition of auditory stimuli in order to retain knowledge.

The teaching of phonics has been advocated as the solution to all present day reading problems. Educators have failed to emphasize the fact that the developmental aspect of audition makes the teaching of phonics useless until a sufficient level of maturation is reached. Variations in this maturation make the teaching of phonics to all children at the same age impossible. Auditory testing might aid in determining for the individual the point at which phonics teaching would be most effective.

This study is needed in order that more may be learned about how children hear. It is possible that primary reading instructions may be too concerned with what is taught and how it is taught and not be concerned enough with the reception of instruction. Faulty reception through a television or radio set is viewed with alarm but much of the instruction given in schools may go awry because of faulty pupil reception.

CHAPTER II

REVIEW OF RELATED STUDIES

Prognosis of reading success has, in the past, been made primarily on the basis of mental age. It has been customary to use tests of intelligence and reading readiness to determine when children are ready for reading or whether they should be allowed to enter the first grade. These tests, based mostly on visual discrimination, vocabulary, and ability to follow directions, have given some indication which children will probably prove successful in reading.

However, as early as 1937, Gates assembled data concerning the relationship between mental age and success in learning to read in grade one and made the following statement:

> The fact remains, however, that it has by no means been proved as yet that a mental age of six and a half years is a proper minimum to prescribe for learning to read by all school methods, or organizations or all types of teaching skill and procedure. It is quite conceivable --indeed the evidence in general tends now definitely to show-- that the crucial mental age level will vary with the materials; the type of teaching; the skill of the teacher; the size of the class; the amount of preceding preparatory work; the thoroughness of examination; the frequency and treatment of special difficulties, such as visual defects of the pupil; and other factors. (page 497)

Harrington (1955, page 375) deplores the confidence with which prognosis of reading success has been estimated from intelligence testing, using six years as the assumed mental age at which reading success could be assured. She says that little attention has been paid to the growing evidence that much success in reading tests is due to perceptual abilities which may be relatively independent of mental age. The background abilities she lists as related to success in reading are visual and

auditory perception and ability in phonics.

Present day educational systems have done much to improve and reduce variation in instruction by providing a wide variety of basic reading texts accompanied by workbooks and well organized manuals. Better instruction in the techniques, aims and objectives of the reading program at the teacher training level is having its effect on the skill of the teachers. In many cases class loads at the primary level have been reduced. More attention is being paid to the detection of visual defects. It is now essential that other factors such as auditory acuity, ability to perceive differences and likenesses in speech sounds and ability to remember sounds and words when heard should be considered. It is possible that such factors when tested in conjunction with intelligence might greatly aid in determining which children are ready for reading, which children will have difficulty with reading, when phonetic teaching should begin and which methods will best suit the individual child.

No attempt has been made to link specific auditory abilities with specific reading skills or defects. It must be admitted that great difficulty is encountered in testing auditory acuity of children at school entrance age due to their short concentration span, inability to follow instructions, and also to lack of proper testing equipment. Lack of proper testing equipment and materials and difficulty in devising tests which isolate and test specific auditory abilities have also impeded educational research in this area. Perceptual testing to determine whether a child learns best by sight, hearing or tactile methods has not been attempted at the beginning level. Much

experimental work remains to be done in these fields.

REVIEW OF LITERATURE CONCERNED WITH AUDITORY ACUITY AS A FACTOR IN READING READINESS

Auditory acuity, that is the ability to hear sound correctly, is often disregarded when testing children for reading readiness. One glance around the classroom usually reveals children wearing glasses, evidence of visual defects that range from acute to very slight. Careful checking of vision has become commonplace and most children have some type of visual check upon entering school. Less frequently and far less accurately are checks made for hearing defects. Yet these same hearing defects may have far reaching implications in the educational career of children. They may be a contributing cause in lack of reading readiness and a factor in determining the best method of teaching the child to read. Early detection may prevent emotional and reading disability problems. Research in this field should aid teachers in improving methods of teaching reading not only with children with severe disability but those with minor difficulties. This study is concerned mainly with children whose disabilities keep them within the normal classroom.

Yoakam (1955) points out why a hearing defect is a factor in a child's success in learning to read:

> Not only is reading a visual matter, but it is closely related to the ability of the child to identify the sounds of words and to attach meaning to the auditory symbols. In the pre-school period, the child learns to speak through listening to those around him and imitating the speech sounds. He attaches meaning to the sounds of words and develops a hearing and speaking vocabulary.

> If the child's hearing is not normal, his experiences in hearing and understanding words are limited by the extent to which he hears adequately and learns to discriminate among the words and to attach the correct meaning to them. The extent to which a hearing loss prevents a child from learning to read normally depends upon the nature of the loss and his ability to compensate for it. (Page 59)

Hildreth (1950, page 286) stresses the fact that defective hearing retards language development. Such impairment, she says, may result in a child being inattentive because he cannot hear what is said and so is unable to follow directions. It might be added that the development of such an inattentive attitude is an educational factor which cannot be measured and greatly complicates auditory difficulties in learning to read.

Partial deafness, even in a marked degree, is not always recognized by the child himself, his parents or his teachers. O'Connor and Streng (1950, page 154) state that hard of hearing children are often unaware of their own hearing loss because they have no standard on which to judge their own acuity. According to Gates (1937, page 400) teachers are often oblivious of hearing deficiencies so serious that the pupil cannot clearly understand what is being said or read to him. Such children are often thought merely to be inattentive, indifferent or lazy. Parents, too, have failed to realize that a child has difficulty hearing. Undetected hearing loss will probably result in the child having a smaller vocabulary than the normal child and thus he may experience difficulty in the understanding of the matching of speech words with words in print and also in following the teacher's directions.

When we attempt to understand how such a child hears, the reason for the difficulty becomes more obvious. Using Streng's (1955)

simplified classification which is only applicable to children whose losses are irremediable and who have impaired hearing from a time before which language was established, some idea is obtained of how language is affected by impaired hearing.

> Class 1 They are the children with mild losses (20 to 25 db in the better ear in the speech range). They learn speech by ear and are on the borderline between the normally hearing and those with significant defective hearing.
>
> Class 2 They are the children with marginal losses (30 -40 db). They have difficulty in understanding speech by ear at a distance of more than a few feet and in following group conversation.
>
> Class 3 They are the children with moderate losses (40 -60 db). They have enough hearing to learn language and speech through the ear when sound is amplified for them and when the auditory sense is aided by the visual.
>
> The children in these first three categories may be considered as being hard of hearing.
>
> Class 4 They are the children with severe losses (60 to 75 db). They have trainable residual hearing but their language and speech will not develop spontaneously, so they must learn to communicate through the use of specialized techniques. They are on the borderline between the hard of hearing and the deaf, and may be considered "educationally deaf" or partially deaf.
>
> Class 5 They are the children with profound losses (greater than 75 db). They cannot learn to understand language by ear alone, even with an amplification of sound. (pages 164-165)

The acoustically handicapped child must, of course, supplement his ears with his eyes and even call upon his tactile sense to achieve perception and communication. Ability to hear will vary with concentration and be seriously affected by intelligence. Avery (1958, page 342) states that damage to the auditory sense is characterized by better hearing for low frequencies than for high ones. Ewing describes this as "high tone deafness," "a difficulty in discriminating speech sounds especially consonants because the sound of which they are composed tends to occur

in the upper rather than in the lower part of the speech frequencies." (Page 108) Vowels are generally low in pitch, while consonants are high. This results in the consonants being misheard by a person with auditory damage. Avery (1958) makes a vivid illustration of how children with varying degrees of auditory acuity might hear a phrase from the nursery rhyme "Three Blind Mice" using Streng's classification.

Profound loss: would hear nothing, not even that someone was talking.

Severe loss:	--ee --i-- -i--, --ee --i-- -i--, -ee -ow --ey -u-! (Volume would be as faint as a whisper.)
Moderate loss:	--ee --i-- mi--, --ee --i-- mi--, -ee -ow --ey ru-! (Volume would be faint but not as soft as a whisper.)
Marginal loss:	--ee blin- mi--, --ee blin- mi--, --ee -ow --ey run! (Volume would be diminished more than with a severe cold.)
Mild loss:	--ree blin- mi--, --ree blin- mi--, -ee -ow they run! (Volume is a trifle diminished.)
Normal hearing:	Three blind mice, three blind mice, see how they run! (Pages 342-343)

This example is considerably simplified but it does give some idea of the difficulty encountered.

According to Streng (1955, pages 176-177), children who are hard of hearing may have trouble with the mechanics of speech, make errors in word placement in a sentence, use the incorrect tense of the verb, omit the conjunctions and prepositions and use simpler words in description. An Edmonton teacher of the hard of hearing remarked that it is difficult to teach such children abstract ideas or words. In further description

of the difficulties facing children with percentual losses in the high frequencies. Streng says that they will be unable to hear the high frequency sounds "s", "z", "sh" and "ch", "th" as in think, "th" as in that, "p", "b", "t", "d", "f", "v" and "h". (page 78) Streng also says:

> Hard of hearing children who learn oral language naturally, learn to interpret printed symbols and learn to read at ages comparable to their brothers and sisters, though more attention must be devoted to their vocabularies and to clarifying unfamiliar verbal concepts. (page 178)

Obviously much of the problem is in identifying these children in order to give them special help.

Hearing can be most accurately assessed by means of an audiometer. The first audiometer was designed by Alexander Graham Bell in 1892. However, it is not until recent years that the use of the pure tone audiometer has become general in testing school children. It provides precise measurements over the range of frequencies ordinarily covered by the human voice. High tone deafness which involves the inability to hear consonant sounds is readily detected by this device. A zero decibel loss indicates normal hearing. Measurement is made by comparing the significant hearing loss with normal hearing. Vernon (1958, page 125) states that children with slight hearing loss, particulary cases of high frequency loss, go unnoticed because detection is only possible with audiometric examination. Since these children are given no special attention or training, they are obliged to try to read on the basis of a more or less sketchy idea of what the teacher says and what speech sounds are like.

In the Edmonton Public School System a sweep test is being made at the Grade Four level. Children experiencing difficulty at this level

are then tested individually and referred for further testing if necessary. Teachers suspecting hearing loss at other grade levels may send children for individual audiometer tests but this is done infrequently. Audiometric testing is only a comparatively recent development in Alberta. Most of the audiometers have only been in use since 1957 and no accurate statistics are available as to the incidence of deafness among school children in the province since so few children have been tested. In fact very few children have been tested before or shortly after entering school. Most doctors and health units still make use of the watch tick or whisper tests which are far from scientific methods of detection.

In fact, any Canadian figures appear to be rough estimates based on surveys in other countries. The only published Canadian survey of the hearing loss of school children appears to be a very comprehensive study by Conway (1937). He tested 1000 children aged 10-13 years in Toronto with an audiometer which he constructed himself. He found that 10.6 per cent of the pupils showed an average hearing loss of ten or more sensation units. Almost 8 per cent of the pupils were hard of hearing in one ear and 2.7 per cent were hard of hearing in both ears. The maximum hearing loss found was 60 decibels. He estimated the mean average hearing losses greater than 20 decibels caused retardation of 10 to 15 per cent which he estimated would cost public school supporters over $20,000. Even in 1937 Conway reported that Canada was far behind other countries in the scientific detection of hearing losses.

Two interesting aspects of his study were the emphasis on the need for clarity of speech and improvement of diction among teachers and a

study of noise levels in classrooms.

In the United States, Dahl (1949) attempted to summarize surveys but found there was a wide range from one group to another in the percentages of children quoted as suffering from hearing impairment. The number of children with hearing losses reported by various studies varied from 3 to about 20 per cent with a median of 10 per cent. O'Connor and Streng (1950, page 156) give the most generally accepted loss in the United States as 5 per cent. The great disparity in reports was due to the lack of uniformity in methods of testing, techniques of measurement and standards in reporting hearing loss. In spite of this disparity, it is apparent that a large number of school children have serious impairment and others, unless given proper medical treatment, will develop hearing losses. As Dahl points out, although we know many children do have impaired hearing, little has been done about it. The public is lethargic. Deafness is still, in some cases, confused with stupidity.

More recent information quoted in the <u>Encyclopedia of Educational Research</u> by Fouracre (1960, page 996) shows that in 1954, results of a survey by the U. S. Office of Education showed that 11,932 hard of hearing children were receiving special education in public day schools. The American Public Health Association estimates that approximately 5 per cent of the school population may be found to have measurable hearing loss and that 1.5 to 3 per cent of school children have defects severe enough to require special medical care and educational help. Fouracre (page 997) also reports that the numbers of hard of hearing population are less than anticipated, due probably to widespread use of newer types of medical treatment, particularly antibiotics. Another hopeful note is

struck by reports of improved methods of testing small children by using familiar sounds and psycho-galvanic skin response. Further research may reduce the cost of such methods and make hearing surveys general even at the pre-school level.

In spite of the difficulties encountered in testing young children, Ewing (1960) tells of the recommendation of the Medical Research Council in England that the testing of hearing with individual pure tone testing be begun at five or six years of age at frequencies between 250 and 6000 cycles per second. He says, "It is important that pupils should be tested as soon as possible after admission to school to avoid risk that those with defective hearing may become failures with all the damage to emotional and social development, as well as to educational attainment of which we see evidence in our clinics, week by week." (page 170)

An interesting audiometric survey in Fife, Scotland (1956) was conducted for the purpose of ascertaining children with a hearing deficiency who required special education. An attempt was made to standardize procedures used, train examiners and match educational data on auditory defectives with similar normal hearing children. Of the 4170 children tested, 325 were found to be defective. In educational comparison it was found that the 57 pupils with the greatest hearing loss attending ordinary schools were about 18 months behind the average but comparison with corresponding pupils in the control group indicated that only about 9 months of this could be the result of hearing loss. The reasoning behind this discounting of educational loss on the grounds of intelligence may be faulty since deafness may be responsible for the lowering of verbal intelligence. In Reynold's study (1953, page 449) no significant

correlation between hearing loss and reading scores was found when the effects of intelligence were eliminated. It would seem that such factors could not easily be accurately estimated or discounted. However, this Scottish survey has much information which has educational bearing and should aid in the conducting of audiometric surveys.

In spite of the known difficulties encountered in teaching language to deaf children, Johnson (1957, page 5), reviewing the literature on hearing loss and its connection with reading difficulties, found that inconclusive results had been obtained by researchers attempting to establish a relationship between reading retardation and hearing loss. Vernon (1957, page 126) explains that this type of research result is obtained when the average hearing acuity of backward readers with appreciable hearing loss is calculated along with those backward readers with normal hearing. The resulting statistics give a false impression since we have no evidence as to how numerous these cases may be. Gates and Bond (1935-36) take this into account in their study of reading readiness when they make this qualifying statement:

> Although the correlation with hearing loss and final reading achievement was not very high, the pupils in the near-failing group showed appreciably or greater amount of hearing loss than did the group as a whole. In fact, six out of ten were below the average in this respect, and three of the reading failures showed rather marked hearing loss. (Page 681)

Kennedy (1942) and Henry (1947) both correlated reading performance with auditory acuity. Kennedy (Page 249) found that there was some degree of high frequency loss fairly frequently among six year old children and that auditory acuity of six year olds was lower at almost every frequency than that of eight year olds. Henry (Page 15) found

no significant difference in acuity with age but high frequency loss was closely associated with reading disability and there was a superiority of female hearing for high tone. Kennedy's findings might suggest a developmental factor in hearing or greater difficulty in testing younger children. Henry's results may indicate one reason why we have more failures in reading among boys than girls. Both concluded that though not all children with poor hearing are poor readers, poor hearing is a contributory factor in some cases of poor reading. From these findings it would appear that high frequency loss has bearing on reading difficulty as well as upon speech and language as Avery has pointed out.

Indeed one comprehensive study of the auditory and speech characteristics of poor readers by Bond (1935) did reveal significant statistical differences. Using a matched control technique for investigation and combining case study and statistical methods, Bond studied an experimental group of 64 children with reading disability and 64 children of average and better reading ability. These children had a mean age of 8½ years and I.Q.'s of 85 and over. He found in the control group 11 per cent with a hearing loss of 15 per cent or more, compared with 30 per cent among the poor readers. Moreover, while only 4 per cent of the normal readers had a significant hearing loss, 63 per cent of the retarded readers could be classified as hard of hearing. Bond's experiment examined the reading methods used in teaching these children. In schools where phonetics and predominantly oral methods were used, a larger number of hearing defects were found among the poor readers than among the normal readers. Where oral instruction and phonetics were not

fundamental a predominantly "look-and-say" method being used, the number of poor readers were not reliably greater among those with a hearing defect. From Bond's evidence it would seem likely that hard of hearing children need not be poor readers if the method takes advantage of their perceptual strengths and does not emphasize their weaknesses.

Fiedler's (1949) study relates to problems arising from undetected hearing loss. 1180 pupils in primary grades were tested by the pure tone audiometer test. Reports from the classroom teacher were then obtained as to which of these children showed problems related to speech, reading or spelling, suspected hearing loss, ear, nose or throat pathology and school retardation. A significant number of these children rated as hard of hearing problems. Fiedler's study suggests that there is a definite value in testing primary school children for hearing acuity and a need for increased awareness among teachers of the possibility of hearing defects as a factor in school achievement and adjustment. She found 24 per cent of the 83 children considered to have hearing losses were named as having difficulties in reading, spelling and phonics.

Monroe (1951, page 110) suggests that children should learn more about the various qualities of sound with reference to language before they learn to read. Such qualities of language as loudness, softness, highness, lowness, shortness, longness, pureness or complexity should be brought to their attention. They should be made to realize sounds have intensity, pitch, timbre, duration and sequence. In dealing with hard of hearing children, she thinks teachers should realize that children hear more effectively when pronunciation is clear rather than when volume is increased and that deaf children need kindly help to avoid developing

the lonely withdrawn personality that results from even slight deafness.

Witty (1954) and Schonell (1948) support Bond's findings with regard to look-and-say methods of teaching. Ewing believes that auditory handicapped children should be placed in regular school situations whenever possible but only in conjunction with or following special training if the impairment requires it. He deplores, however, the practice of providing children with hearing aids without giving them training as to how to use them. Once the child has been identified as hard of hearing, favorable class placement, the use of small groups in instruction, clear enunciation by the teacher and lip reading training greatly aid his progress. Schonell says (page 174) that the partially deaf child makes immediate progress in reading once his difficulty is discovered and appropriate methods applied. This does not, however, imply a total neglect of word sounds but merely an emphasis on the visual approach.

Stahlem (1960, pages 480-483) in studying the needs of the auditorily handicapped child found that hearing difficulties do produce differences in behavior and performance. She felt the most pressing question was whether we have enough imagination to take full advantage of the potential tools, e.g. hearing aids, lip reading, sound spectrograph etc., and to design research to help these children. The child with a mild hearing loss can be absorbed into the regular classroom with some speech or lip reading help in a special class. She also suggested that parents need instruction and counseling to enhance the educational program for children with a hearing problem.

Here in Alberta, the School for the Deaf is equipped to handle the

profoundly deaf cases but we have, as yet, only three classes in the province for the hard of hearing, two in Edmonton and one in Calgary. Not only are our methods of detecting these children woefully inadequate but many hard of hearing children are receiving no special training and using no auditory equipment. There is a need for trained people to teach auditory training, lip reading and speech therapy. Instead of exasperation and indifference these children need understanding and help. Early detection is essential to prepare these children if we are to prevent them from becoming educational problems.

Kennedy (1942, page 239) makes an interesting suggestion:

> In instances of blurred or indistinct auditory impressions it may be difficult to make the associations with the visual symbol. Reading may be further handicapped since an auditory difficulty would limit certain types of direct experiencing as well as vicarious experiencing through normal verbal patterns of communication-- On the other hand, there may be instances in which this handicap, like myopia, may in limiting one's normal patterns of learning, cause him to turn more and more to printed symbols as a vicarious form of experience and companionship.

Kennedy (1942, page 251) also makes several worthwhile recommendations as to where study is needed. She feels there is a need to determine just how much of one's hearing ability is learned. In speaking of hearing ability she includes both auditory discrimination and acuity. This study should entail the testing of a large normal population. She also suggests that new standards and new tests are greatly needed in order to determine "how one hears" as well as "what one hears."

Summary

Lack of auditory acuity may be responsible for lack of reading readiness. The hard of hearing child may have difficulty with language

facility, speech may be faulty, information background may be limited and the child may not be able to communicate easily with other people. He may have trouble matching the sounds he hears with words on the printed page. Following directions may be difficult for him. Emotional and educational implications may result from hearing loss especially where the loss is undetected. Early detection of hearing loss is important.

When teaching methods are suited to the disability reading may be taught more easily. Emphasis on visual rather than auditory methods have proved more effective in teaching hard of hearing children to read. Individual ability to compensate may affect ability to learn.

Henry (1947, page 211) pointed to the paucity of research relating to the hearing abilities of children. There is a need to bring scientific methods to bear not only on the educational but also the psychological aspects of this problem.

REVIEW OF LITERATURE CONCERNED WITH AUDITORY DISCRIMINATION AS A FACTOR IN READING READINESS

It is possible that a child may have the ability to hear sounds but lack the ability to perceive whether sounds are the same or different. He may be unable to distinguish one sound pattern from another or to combine those sound patterns to make a word. This ability to discriminate auditorily matures and can be trained. As a factor in reading readiness it affects a child's ability

to understand and retain phonetic knowledge and also to match the written with the spoken word.

Betts (1946, page 129) commenting on auditory discrimination as a factor in reading readiness, says that some children do not appear to hear the likenesses and differences among the sounds of words, while other children run their words together because they cannot detect separate words. He suggests that auditory discrimination should be developed during the pre-reading as well as during the reading instruction period. The ability to discriminate between speech sounds is a basic factor in language readiness for reading and most children can profit from well-planned developmental activities in "ear training." He warns, however, against over emphasis on the mechanical details of discrimination when mental maturity is lacking. Betts developed exercises for improving auditory discrimination, tests for determining auditory abilities, and studied the reasons or causes of inadequate auditory perception. He lists hearing impairment, inadequate background of experience, mental immaturity and associative learning handicaps as responsible for auditory perception difficulties. He points out that sound discrimination, like auditory acuity, is difficult to test in six year olds and is dependent on the enunciation of the examiner.

Using the same premise as Betts, a number of investigations in

connection with auditory training have been carried out under Donald D. Durrell at Boston University, which provide experimental evidence of the merit of this practice. In summarizing these experimental studies, D.D.Durrell (1953) remarks, "It is gratifying to note that almost every modern reading system has, in the past few years, included practice in noticing sound in spoken words." (Page 556)

Murphy conducted two experiments to investigate the effect of ear training exercises, that is, systematic instruction in auditory discrimination on children in the beginning stages of reading. In the first experiment (1940) both visual and auditory discrimination were investigated with a group of 150 children having difficulty with reading in the first grade. Fifty children received special visual discrimination lessons, fifty continued ordinary classroom work and fifty were given ten minutes of ear training daily for a period of six weeks. The three groups were matched with respect to intelligence and learning rate. At the end of the period results showed that the two experimental groups had doubled their ability to retain words while the control group had increased its scores only slightly.

The second, more elaborate experiment (1943), was concerned with 540 pupils in thirteen classrooms who were divided into four groups equated for mental age, learning rate, speaking vocabulary and auditory discrimination ability. One group received ear training, one visual discrimination training and the third a combination of both and the fourth group followed exercises in the regular reading system. All special exercise periods were limited to ten minutes per day and were given as part of the regular daily reading period. Later these special exercises

were revised and combined to form special training books. The special training in visual discrimination of word elements brought comparable gains to the ear training group and the combination of the two yielded gains superior to either, even though equal time was given in each of the three cases. The training period of six weeks was short and probably to assess the results properly should have been continued for the whole year. Children with high initial auditory ability profited little from the exercises but children low in ability made significant gains. This might indicate maturation rather than training might be responsible for part of the gain.

Further investigations under Durrell deal with other methods of ear training used by Crossley (1948) and Bresnahan (1952). Crossley used lantern slides which showed objects familiar to the child, illustrating beginning and ending consonants, vowel sounds and rhyming. Her training produced significant gains in reading achievement and yielded an interesting comparison of children paired for mental scores but differing in auditory ability on the Gates Reading tests:

	Word Reading	Sentence Reading	Paragraph Reading
High Auditory	37.4	31.5	18.8
Low Auditory	28.0	23.9	13.3

Bresnahan experimented with ten phonograph records designed to teach the child to identify sounds in the spoken words, using 180 kindergarten children during the second half of their school year. These children were matched with 180 children for mental age, learning rate and auditory discrimination of word elements. Again a training period of six weeks was used. Statistically significant gains in auditory analysis of word

elements appeared only where the children had very low ability in analysis of word elements. This type of training might be much more effective with older children. Maturity may be necessary in order to insure significant gains.

Harrington (1955) tested 500 children in the parochial schools in the Archdiocese of Boston with an auditory discrimination test which measured the child's ability to notice initial consonants, rhyming at the end of words, final consonants, and a combination of initial and final consonants in words spoken by the examiner. Ability in phonics was also measured by an individual test which asked the child to give sounds of letters, consonant blends and to show a knowledge of the influence of the final "e" on word pronunciation.

Using the entire population, she obtained zero correlations with reading for four factors: visual discrimination .64; phonics .56; auditory discrimination .54; mental age .23. The low correlation with mental age might be explained as due to the fact the Otis Quick Scoring Mental Ability Test was used. This test which is primarily a measure of oral language comprehension would not test many of the visual reading readiness responses which would be found in such a test as the Detroit Beginning First Grade Intelligence Test.

Harrington (1955, page 380) found that both visual and auditory discrimination play an extremely important part in acquiring an initial reading vocabulary; phonic knowledge has a higher relation to reading achievement than any other factor studied. Thus, she concluded that specific instruction in phonics and auditory and visual discrimination of word elements is essential to success in building reading vocabulary

in the first grade. This conclusion seems to be almost completely opposite to that reached by Bond in 1935.

Bond used tests where children were asked to blend given phonetic sounds into words. He found that children poor in auditory ability, taught by the phonetic method, although they knew the phonetic sounds, could not understand or make use of them in an intelligent manner. The look-and-say method for children of this type was found to be better. One might conclude that the phonetic method using auditory discrimination training might be superior to that which was used in the schools tested by Bond.

An experiment dealing with the relation between the use of phonics and the general maturity shown by an intelligence test was conducted by Dolch and Bloomster (1937, pages 201-204). They concluded that the minimum mental age for phonic readiness was seven years and while children of high mental age sometimes fail to acquire phonic ability, children with low mental ability are certain to do so. They recommended that ear training, which is the basis of phonics, begin early, and that children be taught to notice the similarities between sounds. It was felt that schools were probably expecting results from phonic teaching too soon.

From the data obtained from an educational experiment with one hundred and fifty first and second grade children as well as clinical experience, Wepman (1960) developed an auditory discrimination theory:

> 1. There is evidence that the more nearly alike two phonemes are in phonetic structure, the more likely they are to be misinterpreted.
>
> 2. Individuals differ in their ability to discriminate sounds.

3. The ability to discriminate frequently matures as late as the child's eight year.

4. There is a strong positive relation between slow development of auditory discrimination and inaccurate pronunciation.

5. There is a positive relation between poor discrimination and poor reading.

6. While poor discrimination may be at the root of both speech and reading difficulties, it often affects only reading or speaking.

7. There is little if any relation between the development of auditory discrimination and intelligence as measured by most intelligence tests. (Page 326)

Wepman also believes that audition develops sequentially on at least three levels with sequential development within each level. Acuity, the ability of the ear to collect sounds from the environment and transmit them to the nervous system appears first. Next, understanding, the ability of the central nervous system to extract and interpret meaning, develops. Finally, discrimination and retention, the abilities that permit the individual to moderate his speech or to make accurate phonic comparisons, make their appearance.

Wepman's theories and observations support his pleas for individualization of instruction so that visual learners and auditory learners may begin reading in such a manner that they will capitalize on their strengths in perception until such a time as their developmental processes come into balance through training or maturation. Ewers (1950) after exhaustive auditory tests reached a similar conclusion. She attempted to relate reading abilities to auditory abilities tested by forty three different acoustical tests. However, she feels that teachers

have no basis for relying exclusively on or overemphasizing the phonetic of "sound" methods in teaching reading but more study is needed regarding the relative significance of other means of word attack. She found low or negative correlations between auditory skills and reading proficiency.

Vernon (1958, page 61) points out that in the conclusions drawn from testing children older than eight, deficiency in hearing phonetic sounds of letters, letter combinations and words really clearly, and remembering them sufficiently well to be able to reproduce them in association with the corresponding printed letters and words, may be due to the fact that the child has failed to learn to read. He is, in fact, confused by the whole process. She also feels that no evidence has been presented to support Schonell (1948, page 174) or Monroe (1932, page 95) in their postulation that lack of auditory discrimination may be innate.

Monroe (1932, page 94) compared the results obtained from 32 reading defect cases with 32 control cases. She used a test composed of twenty pairs of words, some of which were the same and some of which were different but similar in sound. She found the control cases, unselected grade one children, made a mean score of 1.5 mistakes. Their mean chronological age was 6.9, their mean mental age 7.4 and mean I.Q. 109. The reading defect cases made a score of 4.58 mistakes although their mean chronological age was 8.5 years and mean I.Q. 99. Their mean mental age was 8.4.

In this experiment Monroe proved that the controls, although less mature chronologically and mentally than the reading defect group made fewer errors in auditory word discrimination. She advanced the theory that lack of auditory discrimination might be a special innate defect

like color-blindness in vision. It would seem in this study that intelligence might have some bearing rather than innate ability or, as Vernon suggests, mere failure to read may have aggravated the situation.

Schonell (1948, page 174) maintains that there are certain children whose deficiency in auditory discrimination is not due to organic defects but only yields to continuous and careful training in comparing and contrasting speech sound values in a scientifically ordered manner, supplemented by emphasis on visual and kinaesthetic impression of words. He calls it "a delayed auditory maturity in a particular aspect of the language." He says as experience increases and intelligence matures this special weakness of auditory perception seems to decrease but spelling still remains faulty and difficulty is experienced in learning a foreign language.

Commenting on the findings of Dolch and Bloomster (1937), Harris (1959, page 328) feels that the results obtained were based on a phonic test which presented the children with a more difficult task than that presented by a connected reading situation. Therefore, he suggests, that modern basal reading series which base their phonetic training on this research may tend to underestimate the readiness of beginners. He endorses the research at Boston University which has established the importance of providing specific training in auditory discrimination. The child, he says, who has not learned to pay attention to detail and still has the uncritical and unanalytical attitude common in pre-school children, responds and often makes rapid progress when given specific perceptual training. It would appear that although most authorities admit that auditory discrimination is developmental and related to

phonetic learning, they now agree that it does respond to training.

In testing 629 children in grades 4, 5 and 6, Wheeler and Wheeler (1954) found that some children make more use of auditory discrimination than others. They emphasize the need for further experimental study with regard to auditory discrimination and suggest that psychologists have yet to determine "the central or peripheral specificity of functioning of auditory abilities in the nervous system."

Reynolds (1953, page 449) concluded his study with the statement that he had found no evidence to support the view that the auditory measures used in the experiment would add significantly to mental age in the prediction of general reading ability and suggests the need for revaluation of such instruments for measuring auditory capacities as are included in diagnostic reading batteries. This statement would appear diametrically opposite to that of Harrington (1955) but he does admit that success in certain reading skills may be highly predictable under certain circumstances.

<u>Summary</u>

As a factor in reading readiness, auditory discrimination contributes to language ability which is necessary in learning to read and is a basic factor in phonic insight. Causes may be lack of hearing acuity, poor experiential background, mental immaturity or associative difficulties. It is developmental and yields to training through the "ear-training" exercises as well as incidental language situations. The postulation that it is innate has not been proved. Further research and better tests are needed to determine significance with respect to reading.

REVIEW OF LITERATURE CONCERNED WITH AUDITORY MEMORY AS A FACTOR IN READING READINESS

Gray ([illegible], page 14) described lack of auditory memory as "the failure to remember what is heard." He believed that this lack resulted in the inability to remember sounds of words and consequently in confusion or even complete failure in reading. The small child has often a short concentration span and oral instruction fails to be understood or retained. It is agreed by most investigators that deficiency in auditory memory span has a deleterious effect on reading readiness. Betts (1950, page 126) found that a short auditory memory span resulted in inability to master word recognition techniques.

In commenting on memory span Johnson (1955, page 565) says:

> In order to be successful in reading, an individual must be able to deal with oral and printed language symbols. His auditory and visual perception must be adequate to assure his associating meaning with these symbols. In addition he must be able to recall these associations and thus recognize the language symbols. This means that memory and memory span must be considered in relation to reading. Measures of memory span are, in part, measures of attention and concentration. Personality deviations which disturb or make impossible concentrated attention, therefore, would tend to decrease the measurable memory span. Relationship between memory span and reading ability, therefore, must be considered in the light of many other factors such as visual and auditory perception and emotional status.

Rose (1958, pages 459-464) attempted to prove that children referred to a clinic for reading disability had more difficulty than the average with respect to the tests for auditory memory as they occur on Form L of the <u>Stanford Binet Intelligence Test</u>. She concluded that the tests of auditory memory span are extremely difficult for a large percentage of children with a severe reading disability. She admits that her study does not prove that short auditory memory span is a cause of reading

disability but she feels it may be a contributing factor or symptom. Further research in this area might reveal that such tests of auditory memory along with other reading readiness tests might predict which pupils will have reading difficulties. It might be possible also to determine whether there are methods of training which will improve the memory span or methods of teaching reading which will circumvent the difficulty.

Poling (1953, pages 107-111) found no statistically significant differences between the means of those with satisfactory and unsatisfactory auditory acuity or high and low auditory discrimination in any area of word discrimination but she did find evidence that inadequate auditory memory span accounts for some of the failure in learning to read. Her population consisted of seventy-eight children ranging in age from eight to thirteen years who had attended the University of Chicago Reading Clinic between 1944 and 1949. She eliminated slow and superior learners by limiting intelligence scores to those between 100 to 120. This limiting of her sample may have accounted for lack of statistical significance in the other areas of her experiment.

Hildreth (1950, page 153) believes that auditory discrimination is best trained through incidental experiences and that artificial drill may tend to separate the skill from its use but she does make some suggestions for training auditory memory, an area neglected by most primary reading series. Here is a field in primary training which has been little investigated.

Harris (1947, page 204) says, "Poor memory for sequence of letters, numbers or words may be found in children of otherwise normal mental ability. If a child's memory span is very short, --for instance, if he can keep in mind a sequence of only three or four letters- he may have difficulty in remembering longer words." To overcome this difficulty, Harris suggests the use of methods that teach words as units rather than letter by letter blending methods. In this same edition we find the statement: "A short memory span for sentences is usually a sign of low general intelligence and may indicate limited possibilities in reading comprehension." (Page 204) In the (1959) edition of his book he omits this statement and suggests that poor memory may be a sign that a child is anxious or emotionally very tense and only rarely does it indicate a special intellectual deficiency. It is true that securing good rapport in testing six year olds may at times be difficult and accurate measures of memory span are hard to obtain at this age or any age when emotional blocking occurs or attention is distracted.

Johnson (1955, page 565) studying the diagnostic and remedial procedures in a reading clinic laboratory school listed poor memory span as a possible cause of poor reading. She listed the order of difficulty of memory span tests from most to least difficult for retarded readers in the following order: auditory unrelated material, digits reversed, visual letters, auditory related oral directions, digits forward, visual objects. She found that memory span for non-verbal materials tends to exceed that for verbal, and related material that for unrelated. Comparison of the results of tests of memory span with Binet's mental age for 28 cases having these tests revealed lower scores

on the tests of memory span for auditory unrelated materials in [illegible] of the cases, for digits reversed [illegible], for auditory related materials in [illegible], for visual letters 78.6% and oral directions 71.4%, for digits forward [illegible] and visual objects [illegible]. Although the sample was small the types of memory span were varied. Testing of a normal population at primary level with this type of tests has apparently not been attempted.

Stauffer (1948) found that significant relationships existed between memory span test findings on retarded readers. He defined memory span in his study as "a manifestation of concentration, sustained attention and associability necessary for immediate reproduction." (page 442) He also found that retarded readers tend to achieve significantly higher scores by a visual auditory mode of presentation than by a visual visual and have significantly higher scores on non-verbal measures of visual memory span than on verbal measures of memory span. Retarded readers achieved significantly higher scores on forward digit span tests than reverse digit span.

<u>Summary</u>

Most investigators feel that lack of auditory memory affects reading retardation but there is an almost complete dearth of investigation of this ability at the primary level. Little effort has been made to train memory at this level and since psychologists agree that it is developmental, there is a possibility that investigations in auditory memory such as those made by Durrell and Wepman in auditory discrimination might prove profitable.

REVIEW OF LITERATURE CONCERNED WITH SEXUAL DIFFERENCES
IN THE AUDITORY ASPECTS OF READING READINESS

Nila Banton Smith challenges reading specialists to put research to practical use when she writes:

> Sex differences are also significant in reading. The fact that girls develop more rapidly than boys is too well established to belabor further. By the time the girl is in second grade, she is actually a year older physically than the boy, because she is a year nearer her final development.
>
> In spite of this knowledge of child development which we possess, teachers by and large expect the same reading achievement from boys as from girls and frequently chide the little boys to "sit still," "pay attention" and "learn to read as well as Susan and Sally." This failure to recognize maturation differences amongst boys and girls may be more largely responsible than any other single factor for starting many boys off on the weary road to reading retardation.
>
> Usually about 90% of the severely retarded readers who are sent to reading clinics are boys. Could it be that many boys would profit by having a different curriculum in primary grades? Could it be that tests should have different norms for boys than for girls? Are these new ideas worth considering? (Page 368)

Demichele (1949) statistically analyzed the results of the Murphy Durrell Diagnostic Reading Readiness Test which had been given to over two thousand boys and girls, according to sex, chronological ages and mental ages. When two hundred of these cases were correlated it was found that girls showed a marked superiority in auditory discrimination. The difference between the means was 4.35 in favor of the girls with a critical ratio of 4.2.

Carroll (1948, page 371) made a study of the sex differences in reading readiness at the first grade level. The results of the Auditory Test (Monroe) showed a difference in mean score of 3.36 with a critical ratio of 2.75. The existing differences were in favor of the girls.

in articulation also, the results were in favor of the girls, with a superiority in mean score of [illegible] which showed a critical ratio of [illegible].

The Monroe tests were given to [illegible] children in two schools in the same town. Of these 46 were girls and 36 boys. In the visual, motor and language measurements there appeared no significant sex difference. The existing differences were in favor of the girls.

The results of the second Monroe Study were obtained from a statistical analysis of scores for nearly 185 children. These, likewise, were separated into scores for 90 girls and 95 boys. All the differences were in favor of the girls. Although the difference fell short of statistical significance, the girls proved to be superior to the boys in auditory discrimination and articulation in both Monroe studies. Although this difference fails to reach statistical standards it may be responsible for some of the difficulty encountered by boys in learning to read.

One interesting fact in connection with differences of this sort is noted by Murphy (1943). Murphy found that auditory differences between boys and girls tended to disappear in the experimental groups who were given special training although the differences remained in her control group.

Carroll (1941) in her thesis remarks: "Much is said by authorities in the reading field regarding sex differences in the various phases of reading. However, little is said and few facts given in regard to sex differences in reading readiness. It would seem that any apparent sex differences of significance appearing during this preparatory period would be vital." (page 1) However, Carroll made no attempt to determine the significance of reading readiness differences made upon reading success.

Summary

We know sexual differences in audition do exist at the readiness level before reading begins. It is possible that the significance of these differences may become apparent with the use of more accurate and valid testing and with larger and more varied population in our samples. More research is necessary in order to understand why more boys have difficulty learning to read than girls. It is possible that auditory differences may be a factor.

LIMITATION OF PREVIOUS STUDIES

Investigations of hearing research are difficult to review or evaluate because of many factors which exist within the experiments themselves such as the design of the experiment, the type of audiometers used in testing for acuity, the type of tests used for measuring auditory discrimination and auditory memory, the reading tests used for correlation, the methods of testing, the population used in the sample, and the methods of statistical analysis. There is also some confusion as to what is meant by certain terms used. Robinson (1946, page 50) defines auditory discrimination as the inability to discriminate between sounds which are similar. Auditory memory span she calls failure to remember sounds. Schonell (1959), on the other hand, combines these two terms in his definition of auditory discrimination: "Weakness in auditory discrimination," he says, "manifests itself in an inability to remember speech sounds, to discriminate between speech sounds somewhat similar in kind and to analyse and synthesise correctly the auditory elements of words." (page 173)

Various methods of testing memory span have been devised using

nonsense syllables, consonants, digits, retelling stories and increasing sentence length. The variety of methods used in testing makes true comparison of auditory memory from various studies difficult. Johnson (1957) in reviewing literature says:

> Various approaches have been made to investigation of the possible influence of memory span on reading ability. In certain studies the developmental view has been taken. In others, the relationship between performance on tests of memory span and achievement in reading have been studied. In the third kind of investigation the interrelationship among the performances on various memory span tests have been investigated. (Page 11)

Especially in the investigations of auditory acuity we find great differences in the processes of testing and recording results. In some cases the whisper test is used to test auditory acuity and in others complaint is made about the possibility of unreliable instruments. Poling (1953) limited her data on the grounds that the instrument was variable and errors were possible. Conway (1937) made his own instrument. Munroe used the whisper test.

Throughout the literature one finds complaints by the investigators concerning the lack of adequate tests. It is apparent that difficulty is experienced in isolating and testing the abilities to be studied.

Size of sample varies greatly but most of the conclusions are based on very small samples or samples drawn from a limited population. Robinson (1946) found that in none of the thirty cases she studied was auditory acuity a cause of failure in learning to read. On the basis of such a small sample it is difficult to justify her conclusion that low auditory acuity is not cause of failure to learn to read in many cases. Poling (1953) limited her sample to children whose I. Q.'s fell between 100-120 and who all had attended the reading clinic. This

hardly appears to be a normal population.

When the statistics from various investigations are studied we find that various types of intelligence tests have been used to measure mental age and frequently different reading tests have been used to measure reading ability. Since various tests measure different aspects of intelligence and reading, experiments may fail to agree as to results obtained. Often the reading tests, tested only one aspect of reading, e.g. Word Recognition, and failed to correlate auditory ability with other reading skills.

Summary

There will be a definite limitation of knowledge concerning how children hear until more public funds are spent on adequate hearing surveys, more people are trained to test hearing accurately, and more research in the other aspects of hearing as it affects the learning process is carried on. The validity of the results obtained are affected by inadequate tests and the size of the populations tested.

CHAPTER III

THE EXPERIMENTAL DESIGN

This chapter will describe the testing population, the administration and description of tests and the statistical treatment of the data obtained.

The Test Population

The first grade children tested in this experiment were all pupils of Gold Bar Elementary School in the City of Edmonton. The original number of one hundred eighteen children registered as beginners in September 1960 at that school. No child repeating grade one was included in the testing program nor was any child who moved into the district subsequent to the beginning of the school term. Five children moved from the area during the year and one set of test papers was accidentally destroyed. The total sample was, therefore, one hundred twelve children i.e. fifty-two girls and sixty boys.

The children ranged in chronological age from 5 years 6 months to 6 years 11 months. The boys had a mean chronological age of 6 years 2½ months ranging from 5 years 7 months to 6 years 11 months. The girls were slightly younger with a mean age of 6 years ½ month ranging from 5 years 6 months to 6 years 9 months. The difference in mean age was significant at the .05 level. However, the mean age of the entire sample was 6 years 2 months. This information is recorded in Table 1. The mental age of the group ranged from 4 years 3 months to 8 years 5 months with a mean age of 7 years. The difference between the mean mental age of boys and girls was not significant, the difference between the two

means was 4 months. The range for the boys was 4 years 3 months to 8 years 5 months and the girls ranged from 4 years 7 months to 8 years 3 months. The mean I. Q. was 114.7 on the Detroit Beginning First Grade Intelligence Test. This information is to be found in Table I .

The district from which the school draws its pupils is a new housing area. The school itself was in its second year of operation and all of the houses in the district have been built within the past five years. Most of the district is a one family dwelling area but approximately fifteen per cent of the children come from low cost housing constructed in the south of the district. This housing consists of a series of six attached home units.

The children were taught in five different classrooms, four grade one rooms and one combined grade one and two classroom. Instruction during the year was received from four teachers in the grade one classrooms and the combined grade one and two room had two teachers because the original teacher resigned at Easter.

Three different reading series were used in reading instruction: the Ginn Basic Readers published by Ginn and Company, Curriculum Foundation Series published by W. J. Gage and Company and Reading for Meaning published by Houghton Mifflin Company. Teaching methods advocated by the manuals provided with these series were used by the teachers. In no case was a purely phonetic or look-and-say method used. The approach advocated by the Reading for Meaning Series begins phonetic teaching somewhat earlier than the other two series and places slightly more emphasis thereon

but the whole three series advocate a gradually developing sequence of phonetic concepts, use of meaningful repetitions of whole words, auditory and visual readiness training and attractive and interesting pictures and stories. All three series emphasize the developing of word attack by use of meaning clues, picture clues, word form clues and structural and phonetic analysis. All have well organized workbooks which the teachers used in conjunction with the reading texts. Use of such manuals and workbooks has to a certain extent standardized teaching procedures although the individual teacher would approach each series with certain differences in enthusiasm and teaching procedures.

The Testing Instruments

The following tests were used to determine intelligence, auditory abilities and reading achievement.

Intelligence Tests

1. The Detroit Beginning First Grade Intelligence Test (Revised), a group test administered the second week of September.

2. The Detroit Advanced First Grade Intelligence Test - Form A, a group test administered the last week in March.

Auditory Tests

Auditory Memory

1. A Sentence Memory Span Test taken from the Betts Ready to Read Tests, an individual test administered in October and May.

2. An Auditory Story Memory Test, Primary Form, Reading Aptitude Tests by Marion Monroe, an individual test, administered in October.

3. *The [illegible] Memory Span Test*, designed by the examiner, was administered in October.

4. *Alphabet Naming*, individual, tested in May (Neale).

5. *Alphabet Sound*, individual, tested in May (Neale).

Auditory Discrimination

1. *An Auditory Fusion Test* taken from the *Betts Ready to Read Tests*, individual, administered in October.

2. *Newman's Auditory Discrimination Test* - Form A, individual, administered in October and May.

3. *Neale's Auditory Discrimination Checks* through simple spelling, blending and recognition of syllables, individual, administered in May.

4. *Murphy-Durrell Diagnostic Reading Readiness* For Group Use, Test 1, Auditory, administered in October.

Auditory Acuity

1. *Massachusetts Hearing Test*, a group audiometer test, given in February.

2. *Maico, Individual Audiometer Test* administered in May and June.

Reading Achievement Tests

1. *The Neale Analysis of Reading Ability*, an individual oral reading test, administered in June.

2. *The Gates Primary Reading Tests*

Type P. W. R. Word Recognition

Type P. S. R. Sentence Reading

Type P. P. R. Paragraph Reading

These were all group tests administered in May.

Copies of all tests are to be found in the Appendix.

Description of the Tests

Intelligence

1. The Detroit Beginning First Grade Intelligence Test, Revised.

This test is administered the second week in September in all Edmonton grade one classes and has been the basis on which children below the age of six years have been retained in or rejected from grade one classrooms.

The test, which has ten parts, consists of a series of pictures and forms. The child is asked to mark these in identifying them, remember and mark an increasing number of pictures with increasing difficulty of concept, pick out similar pictures and forms, classify by marking certain groups, supply missing details, find errors in pictures, copy certain details, count objects and follow simple directions. It is primarily visual in character and tests ability to follow directions, observe visual detail and understand

certain verbal concepts. It is designed for use prior to reading. Published originally in 1921, it was revised in 1935. Edmonton norms have been established for this test.

During the administration of this test two teachers were present and the children were tested in groups of approximately fifteen. One teacher read the instructions while the second teacher made sure the children understood and were following directions.

2. The Detroit Advanced First-Grade Intelligence Test, Form A.

This test is very similar in design to the Beginning First Grade Intelligence Test and is administered in all Edmonton schools the last week in March. It has seven parts. The pictures and designs are much smaller than in the first test. It tests ability to identify objects, remember directions, supply missing detail, classify objects, observe like objects, follow verbal directions and understand numerical concepts. It requires no reading ability but tests visual perception and the ability to understand simple words and directions. The items are arranged in order of difficulty and each item is timed. The entire test takes approximately thirty-five minutes.

It was designed originally for children who were too far advanced to take the Beginning First Grade Intelligence Test and should not regularly be used above the early months of the low second grade. It is intended merely as a general measure of mental ability to be used in classifying pupils for purposes of instruction. It was copyrighted in 1925 and renewed in 1954 without revision.

Auditory Memory Tests

1. The Sentence Memory Span Test is part of the Betts Ready to Read Tests. It consists of twenty-five sentences graduated in difficulty. The examiner reads the sentence to the individual child without phrasing or repetition. The child must repeat the entire sentence without error. The testing continues until one or more mistakes are made in each of five sentences. The score is the number of sentences correctly repeated. Administration of this test occurred in both October and May.

2. The Auditory Story Memory Test, Primary Form - Reading Aptitude Tests by Marion Monroe.

Here the examiner read the story with expression to each child singly. Then the child was asked to tell what the story was about. Each correct idea reproduced by the child was recorded and the total number of ideas provided a score.

3. The Phonic Memory Span Test was based on the initial and final consonant vowel sounds learned in the first grade and was designed by the investigator. The letter sounds were divided into levels similar to the digit test used in the Wechsler Intelligence Scale for Children. The sounds were said at one second intervals and the child was required to repeat them. Two attempts were allowed at each level. If the first test was correctly repeated the second was not administered and if the second was not correct, no credit was given and the test was discontinued. Sounds were repeated in forward order for the first test and in reverse order for the second half of the test.

4. The Alphabet Naming Test is one of the diagnostic check tests used in the Neale Analysis of Reading. The child is presented with a

page on which the letters of the alphabet are printed not in the usual sequence, and he is asked to say the names of the letters.

4. The Alphabet Sounding Test, another diagnostic check used in the Neale Analysis, requires the child to say the sounds of the letters of the alphabet using the same letters as used in the previous test. Both these tests were administered individually.

Auditory Discrimination Tests

1. The Auditory Fusion Test was taken from the Betts Ready to Read Tests. Eighteen words divided into phonemes are presented to the child orally and he is asked to tell what word the fusion of these phonemes would make ex. ch - o - p. Betts has suggested that this might be a good prognosis of success with certain types of phonetic training and that failure may indicate that a visual approach to beginning reading should be made. The examiner scores the number of words correctly fused. No norms were available but Betts states that a child entering the first grade should not fail on more than seven items.

2. Wepman's Auditory Discrimination Test Form A

In this test paired words either similar in sound or the same words are presented orally to the individual child who is seated with his back to the examiner. The child indicates either by saying "Yes" or "No," "Same" or "Different" whether he recognizes likeness or difference. Correct responses to the sixty-two pairs presented were scored. This test was administered both in October and May.

3. Neale's Auditory Discrimination Checks through simple spelling and blending were also administered with the other tests in May. The

[illegible] in most [illegible], given as a [illegible] group test. The [illegible] test [illegible] was very similar to the [illegible] Design Test and was administered individually in the same manner as the [illegible] test.

[illegible]. The Murphy-Durrell Diagnostic Reading Readiness Test for [illegible] was administered in October to two of the grade one classes and the grade ones from the combined grade one and two classes.

This test consists of three subtests measuring auditory discrimination, visual perception and learning rate. The auditory test, the only part used in this experiment, is made up of 16 sample pictures, or items and 84 test items. Pictures 1 to 48 are designed to test the ability to recognize similarities and differences in the beginning sounds of words, while pictures 49 - 84 test the same ability with respect to final sounds. The examiner pronounces the key word and then the name of the picture. The children must mark with a cross any picture where the name of the picture contains either the same beginning sound as the keyword or in the second part of the test the same ending sound. This test was used in an experiment in 1940 in an attempt to determine the feasibility of measuring auditory discrimination and to establish testing procedure. The present form was revised and used in an experimental study by Biggy carried out at Boston University in 1946. The test took over an hour to administer.

Auditory Acuity

1. Massachusetts Hearing Test

This test, described by both Newby (1958) and Streng (1955) was devised by Dr. Phillip Johnston of the Massachusetts State Department

of Health. It accomplishes pure tone screening for as many as forty children simultaneously depending on the number of receivers used. The unit is produced commercially by the Maico Company. The three frequencies tested 500, 4000 and 6000 are presented at sensation levels of 20, 25 and 30 decibels respectively. The children wearing earphones, must circle a "yes" or "no" on the test form in front of them, depending upon whether they hear or do not hear a tone. Occasionally the audiometrist does not present a tone, thus every paper must contain some "no"responses. In scoring the test the number of "no" responses are counted and if there is a discrepancy of more than two from the correct responses to the test, the child fails the test and should be retested individually. Only one ear is tested at a time.

Since it was only possible to have forty children tested due to lack of time with the audiometer the children who exhibited difficulty with the auditory tests were selected from the total population. Any children who the teacher felt might be experiencing hearing difficulty were also included. These children were tested in February by the Board of Health audiometer operator assisted by the school nurse. Thirteen children experienced difficulty.

2. <u>The Maico Individual Audiometer Test</u>. Testing was done by the present examiner during the month of June. The thirteen children who failed to pass the Massachusetts sweep test were retested individually by this method.

This individual audiometer consists of a portable unit equipped with ear phones. The frequencies 125, 250, 500, 1000, 1500, 2000, 3000, 4000, 6000 and 8000 cycles were tested. The hearing loss dial

regulates the intensity of each test tone in a range of decibel reference levels from slightly above normal to maximum loudness, graduated in five decibel steps. The child is seated so that he cannot see the panel of the audiometer which the examiner operates. Careful explanation as to how the child would indicate hearing the tone was made before testing and the test tone of 30 decibels was usually used at 1000 cycles after the child had the earphones comfortably placed on his ears in order to establish the idea of the sound for which the child must listen. The child indicated either by speaking or handraising when the sound was heard. The results for each ear were indicated graphically on an audiogram card.

Reading Achievement Tests

1. The Neale Analysis of Reading Ability

This oral test of six graduated paragraphs provides reading accuracy, speed and comprehension scores. Four comprehension questions are asked after the first passage and eight after each succeeding one. Designed primarily for diagnostic purposes, the norms were established by testing 2000 English children from poor industrial areas, average urban centres, good residential areas, and semi-rural and rural communities. The accuracy scores of 9, 10, and 11 year olds gave correlations .95, .94 and .95 with scores achieved on the Schonell Graded Reading Vocabulary Test.

To obtain a score on this test for statistical purposes in this experiment the speed score was not calculated but the results in reading accuracy and comprehension were combined to yield a raw score.

Reading accuracy was measured by asking the child to read each passage aloud while the examiner recorded mispronunciations, substitutions, refusals, additions, omissions and reversals when they were made. The number of mistakes was then subtracted from 16 to obtain the raw accuracy score. When the child reached a passage in which sixteen or more errors were made the test was concluded. Comprehension questions were asked only if the child had made the number of permissible errors or less. If more than twelve mistakes were made in one passage the examiner concluded that the next passage would prove too difficult. The raw score in comprehension was the number of questions answered correctly.

2. <u>The Gates Primary Reading Tests</u>

The norms of these tests were based upon a nationwide sampling of schools in the United States. These schools provided a sampling of representative types of instruction, socio-economic status, and levels of intelligence. These three tests are designed to measure different phases of silent reading ability and the range, accuracy and level or power of reading ability in a group test.

<u>Type P. W. R. Word Recognition</u>

Designed to sample the ability to read words representative of the primary vocabulary, this test consists of 48 exercises containing four printed words and a picture which represents one of them. The child is instructed to circle the word which tells most about the picture. The exercises are graduated in difficulty and a fifteen minute time limit is placed on the test. The raw score is obtained from the number correct minus one third the number wrong.

Type P. S. R. Sentence Reading

In this test the ability to read sentences of increasing length and complexity is measured. It consists of 45 sentences, three in each of fifteen exercises. A fifteen minute time limit is placed on the test. The child is asked to read each sentence and mark with a single line the picture which best illustrates its meaning. After reading the second sentence he marks the appropriate picture with two lines and finally he reads the third sentence and marks the correct picture with three lines. In each set of three sentences the child has six pictures from which to choose. The raw score is the number of sentences marked correctly.

Type P. P. R. Paragraph Reading

This test requires the reading of paragraphs of gradually increasing complexity, difficulty and length. It consists of 26 paragraphs accompanied by illustrations which must be marked to indicate that the pupil understands what he reads. A limit of twenty minutes is placed on the test. The child is asked to read the passage and then follow the directions contained therein. The raw score is the number of directions carried out correctly.

Testing Procedures

All the group tests were administered by the classroom teachers, the audiometer operator from the board of health or the present investigator. The individual tests were administered either by the same investigator or one graduate student in education.

Treatment of Data

Only the children who completed all the tests were retained in the sample.

All data and the results obtained were recorded. The information obtained was processed at the computing centre of the University of Alberta. A program was set up which resulted in correlations with twenty variables. The calculations were obtained for the boys and girls separately and the boys and girls combined. Means and standard deviations were obtained.

The difference between the means of boys and girls and the standard error of the differences between the means were then calculated and then tested by the conventional "t" test of significance at the accepted one per cent and five per cent levels.

Multiple correlation was calculated between the Sentence Memory Test, the Detroit Beginning First Grade Test, and each of the four reading tests. Multiple correlation was also calculated between the Wepman Discrimination Test, the Detroit Beginning First Grade Test, and each of the four reading tests.

Analysis of all the resulting data was then made.

CHAPTER IV

ANALYSIS OF DATA AND INTERPRETATION

OF RESULTS

The data obtained from testing one hundred twelve grade ones during the 1960-61 term at Gold Bar Elementary School is presented in this chapter. Intelligence, auditory and reading tests provided statistical data which is shown in table form and then analyzed and explained.

DESCRIPTION OF THE TABLES

Table I shows the number of participants in the test, the range of means and standard deviations obtained for chronological age, mental age and intelligence quotients scored on the two intelligence tests used in this experiment. This table is a record of the total sample results as well as the results of boys and girls shown separately. Comparison of the means of the boys and girls is shown with a recording of observed differences, standard error of the differences and critical ratios. Significant differences are indicated.

Table II is a summary of the range of means and standard deviations for the total group, boys and girls on the reading tests. Comparison of the means of the boys and girls is made and observed differences, standard error of differences and critical ratios are shown. Significant levels are marked at the .01 level of confidence.

Table III records a similar summary of means and standard deviations for the total group boys and girls on the auditory tests used. Comparison

of the means of boys and girls is made and where the difference is significant confidence level is marked.

Table IV makes comparison between the means of test results on the auditory tests administered in October and May for both the boys and the girls. The Sentence Memory Span Test and Wepman Auditory Discrimination Test were the two tests compared. Means, standard deviations, standard errors, observed differences, correlation between tests, standard errors of difference and t- ratios are recorded, showing level of confidence.

Table V records the correlation between all the variables with which the experiment is concerned for the total group. Table VI and Table VII record similar results for boys and girls respectively. Correlations significant at the .01 level of confidence are underlined in red and those at the .05 level in green.

Table VIII contains the data used in calculation of multiple correlation of each of the four reading tests with mental age and the Sentence Memory Span Test and also each of the reading tests with Mental Age and the Wepman Auditory Discrimination Test.

Sixty-two children, two of the four complete grade one classes and the grade ones from the combined grade one and two classroom, were given the Auditory Section of the Murphy-Durrell Reading Readiness Test as an additional measure of auditory discrimination. Table IX shows correlations between the raw scores obtained from this test and the results of these children on the Detroit Beginning First Grade Intelligence Test, the Sentence Memory Span Test, the Wepman Auditory Discrimination Test and the four reading tests. Tables X and XI record similar

TABLE 1

COMPARISON OF CHRONOLOGICAL AGES, MENTAL AGES
AND INTELLIGENCE QUOTIENTS

No. of Pupils Boys 60 Girls 52 Total 112

	Range	Mean	Standard Deviation	Comparison of Means of Boys and Girls: Observed Difference	Standard Error of Difference	Critical Ratio
	A	B	C	D	E	F
1. Chronological Age						
Total	66 - 83 months	73.7 months	3.9			
Boys	67 - 83 months	74.5 months	4.2			
Girls	66 - 79 months	72.7 months	3.4	1.8	.71	±2.53**
Detroit Beginning First Grade Intelligence Test						
2. Mental Age						
Total	51 - 101 months	84.3 months	9.4			
Boys	51 - 101 months	84.1 months	9.3			
Girls	55 - 99 months	84.5 months	9.6	.4	1.80	± .22
3. Intelligence Quotient						
Total	67 - 146	114.7	13.6			
Boys	67 - 139	113.1	13.4			
Girls	76 - 146	116.5	13.5	3.4	2.54	±1.34
Detroit Advanced First Grade Intelligence Test						
4. Mental Age						
Total	70 - 115 months	95.4 months	6.3			
Boys	70 - 115 months	95.5 months	6.1			
Girls	81 - 106 months	95.2 months	6.5	.3	1.19	± .25
5. Intelligence Quotient						
Total	93 - 140	119.3	9.1			
Boys	93 - 140	118.2	9.6			
Girls	103 - 136	120.5	8.2	2.3	1.68	±1.37

** Significant at the .05 level of confidence

information for the boys and girls respectively within this smaller group. Correlations significant at the .01 level of confidence are marked in red and those at .05 level in green.

Table XII shows the summary of means and standard deviations for the sixty-two children to whom the Murphy Durrell Test was administered. This summary includes all the tests correlated in Tables IX, X and XI and makes comparison between the means of the boys and girls in this group. Confidence levels at the .01 and .05 level are indicated where mean differences are significant.

INTERPRETATION OF RESULTS

Chronological Age

The chronological age span of the total group was seventeen months. The boys had an age span of sixteen months while the girls had only thirteen. The mean age of the entire group was 73.7 months. Comparison of the means of chronological ages of the boys and girls revealed an observed difference of 1.8 months in favor of the girls. The critical ratio was $\pm$ 2.53 which is significant at the .05 level of confidence and falls only slightly short of the .01 level. (Table I, A, B, D, F). This significant difference provides an interesting maturation factor in this experiment since it is an accepted fact that boys generally mature more slowly than girls. Even with the added advantage of this significant difference in chronological age it is evident that the boys in this group secured lower means in most of the areas tested.

Correlations of chronological age with intelligence, auditory and reading scores for the total group and for boys and girls revealed negative or indifferent relationships in almost every case. (Tables V, VI, VII) The only correlation showing significant relationship is found where the girls' score in Alphabet Sound Memory shows .38 correlation with chronological age. It is possible that girls become mature enough to profit by training in phonics before boys do.

The lack of significant correlation of chronological age with the other tests may be partially explained by the fact that any child under the chronological age of six on September first, who failed to attain the mental age of five years nine months on the Detroit Beginning First Grade Test was excluded from school by the regulations of the Edmonton Public School System. Children older than six years who obtained low scores were necessarily retained.

INTELLIGENCE

Mental Age and Intelligence Quotients

The range in Mental Age for the entire group on the Detroit Beginning First Grade Intelligence Test was fifty months with a mean of 84.3 months and a standard deviation of 9.4. A range of forty-five months in Mental Age was shown for the Detroit Advanced First Grade Intelligence Test with a mean of 95.4 months and a standard deviation of 6.3. Boys and girls did not have significantly different means in Mental Age on either of the two intelligence tests. (Table I, 2, 4, A, B, C, F).

The range of the Intelligence Quotients on the Detroit Beginning First Grade Intelligence Test was 70 points with a mean of 114.7 and a standard deviation of 13.6; while the Detroit Advanced First Grade Intelligence Test had a range of only 57 points, a mean of 119.3 and a standard deviation of 9.1. No significant difference was found between the means of boys and girls on either of the two intelligence ratings. (Table 1, 4, 5, A, B, C, D).

Both intelligence tests show that boys and girls in this experiment may be considered equivalent with respect to intelligence. Correlation for reliability between the two intelligence measures was not particularly high: .6 between the two Mental Age scores and .69 between the two Intelligence Quotients but this would be affected by the six and one half month period between testing and the fact that certain items on both the intelligence tests depend upon a visual perceptual skill which can be taught. (Table V, 2, 3, S, T).

However, as the Detroit Advanced First Grade Intelligence Test was intended by its authors as a general measure of mental ability to be used in classifying pupils for purposes of instruction and the Mental Age equivalents are only approximate at best, more weight has been given to the Detroit First Grade Intelligence Test in interpreting the results of this experiment. The Detroit Advanced First Grade Intelligence Test has not been revised since it was published in 1925 and many of the pictures present rather antiquated concepts but it did provide an additional check upon intellectual ability. It is used as an aid in classifying children in the Edmonton Public School System for the Continuous Progress Plan.

A need is seen here for a more adequate test, possibly of perceptual skills.

Correlation of Mental Age and Intelligence Quotients obtained from the Detroit Beginning First Grade Intelligence Test with the auditory and reading tests for the whole group was significant at the .01 level of confidence with the exception of Alphabet Sound Memory .22, which was significant at the .05 level. Particularly high correlation was noted between Mental Age and the October administration of the Sentence Memory Span .58 and between Intelligence Quotients and the October administration of the Sentence Memory Span .61. Correlations of this same test used in May with Mental Age .47 and Intelligence Quotients .53 were somewhat lower but still showed marked relationship. The Wepman Discrimination Test, on the other hand showed .48 relationship with both Mental Age and Intelligence Quotients in October and May correlations with these two tests was .30 and .31. (Table V, 2, 3, D, F). Wepman (1960 - page 331) tested grade one pupils at the end of the first year of school and found .32 correlation between the Wepman Word Discrimination Test and the Kuhlman Anderson Intelligence Test using Spearman rank-order correlation. He concluded that there was little if any relationship between the development of auditory discrimination and intelligence as measured by most intelligence tests. Although Wepman did admit that more intelligent children did generally better on this test than less intelligent children, probably because of better concentration, the results of this experiment suggest that at the beginning of the first year of school auditory discrimination may correlate more highly with intelligence than he supposed. The second testing definitely supports his results and agrees with his theory

concerning the developmental nature of discrimination.

Correlations of reading results as measured by the four reading tests with Mental Age and with Intelligence Quotients were quite uniform for the total group. Neale (Oral) .39, .42 Gates: PWR .40, .45, PSR .46, .48, PPR .42, .45. Some interesting variations were seen, however, when examination was made of the correlations of the boys and girls. Mental Age when correlated with Neale (Oral) and the Gates PWR yielded correlations of .27 and .28 for the boys, while the girls' scores showed correlations of .51 and .55 respectively. (Table VI, VII, 2, O, P). Apparently Mental Age does not affect the ability of the boys to recognize words, the important reading factor in both these tests, as much as it does the ability of the girls. However, Intelligence Quotients attained correlations of .36 and .40 with the Neale (Oral) and the Gates PWR for boys, and correlations of .45 and .49 for girls. In spite of the negligible or negative correlations of chronological age with reading scores it would appear that there is some maturity factor here. (Tables VI, VII, 2, O, P).

The greater amount of comprehension needed for success in the Gates PSR and PPR tests was probably responsible for the .42 and .38 correlation for boys and .56 and .48 correlation for girls when these reading scores were correlated with Mental Age.

TABLE II

COMPARISON OF READING TEST RESULTS

No. of Pupils Boys 60 Girls 52 Total 112

Reading Tests		Means			Standard Deviations			Comparison of Means of Boys and Girls		
Name of Test	Date Given	Total	Boys	Girls	Total	Boys	Girls	Observed Differences	Standard Error of Differences	Critical Ratio
		A	B	C	D	E	F	G	H	I
1. Neale Analysis of Reading Ability (Oral)	May	25.0	22.75	27.61	8.92	7.85	9.36	4.86	1.64	± 2.96 *
2. Gates Primary Word Recognition	June	36.07	35.20	37.07	8.32	8.50	7.98	1.87	1.56	± 1.19
3. Gates Primary Sentence Reading	June	32.56	30.06	35.44	9.62	10.09	8.15	5.38	1.73	± 3.12 *
4. Gates Primary Paragraph Reading	June	19.00	18.10	20.05	4.10	4.11	3.83	1.95	.75	± 2.60 *

* Significant at .01 level of confidence

READING TESTS

Comparison of the means of boys and girls on the four reading tests revealed differences in favor of the girls. The <u>Neale Analysis of Reading Ability</u> showed a critical ratio of ± 2.96 significant at the .01 level of confidence. The difference on the <u>Gates Primary Sentence Reading</u> produced a critical ratio of ± 3.12 and the <u>Gates Primary Paragraph Reading</u> ± 2.60 both significant at the .01 level. (Table II, 1, 2, 3, 4, I) The lack of significant difference between the means of boys and girls on the <u>Gates Primary Word Recognition Test</u> might possibly indicate the stage of reading development reached by boys at this period in the year. We know that in order to do independent reading a child must be able to recognize a certain basic number of words. It is apparent that most of the boys in this group had this basic word recognition but had not yet reached the level attained by the girls in applying this knowledge in the increasingly more complex skills of comprehension required in the oral reading test which included comprehension checks and the silent reading tests of sentence and paragraph reading.

However, in spite of the significant differences between the means of boys and girls on these tests it must be realized that most boys and girls secured very adequate results on these tests. The grade equivalents listed for the mean scores in the <u>Manual for the Gates Primary Reading Tests</u> are: <u>Gates PWR</u>, boys 2.77, girls 2.8; <u>Gates PSR,</u> boys 2.75, girls 2.86; <u>Gates PPR</u>, boys 2.6, girls 2.78. These scores suggest that satisfactory reading progress was being made.

TABLE III

COMPARISON OF AUDITORY TEST RESULTS

No. of Pupils Boys 60 Girls 52 Total 112

Auditory Tests		Means			Standard Deviations			Comparison of Means of Boys and Girls		
Name of Test	Date Given	Total	Boys	Girls	Total	Boys	Girls	Observed Differences	Standard Error of Differences	Critical Ratio
		A	B	C	D	E	F	G	H	I
1. Sentence Memory Span	Oct.	12.59	11.73	13.59	4.30	4.14	4.26	1.86	.79	±2.35 **
2. Auditory Fusion	"	10.77	10.83	10.71	3.62	3.14	4.11	.12	.69	± .18
3. Wepman Auditory Discrimination	"	49.39	48.55	50.36	8.14	7.68	8.53	1.81	1.54	±1.18
4. Auditory Story Memory	"	9.28	8.45	10.25	3.95	3.95	3.73	1.80	.73	±2.47 **
5. Phonic Memory Span	"	8.15	8.20	8.09	3.41	3.16	3.68	.11	.66	± .16
6. Sentence Memory Span	May	13.91	13.28	14.63	4.24	4.41	3.90	1.35	.78	±1.73
7. Wepman Auditory Discrimination	"	55.74	56.30	55.09	4.96	4.33	5.52	1.21	.95	±1.27
8. Spelling (Neale)	"	6.66	6.03	7.40	2.98	2.98	2.80	1.37	.54	±2.54 **
9. Alphabet Naming	"	24.17	23.60	24.84	4.56	5.33	3.34	1.24	.82	±1.51
10. Alphabet Sound	"	21.44	20.93	22.03	5.01	4.92	5.05	1.10	.94	±1.17
11. Fusion (Neale)	"	12.62	12.70	12.53	3.51	3.58	3.42	.17	.66	± .26

** Significant at the .05 level of confidence

Correlation between the Neale (Oral) and the three silent reading tests denoted high relationship: Gates PWR .74, PSR .[illegible], PPR .74.

Intercorrelation between the three silent reading tests was also high: Gates PWR with PSR .72 and PPR .77, Gates PSR with PPR .78 (Table V, 15, 16, 17, O, P, Q, R). Similar high correlations were noted in the cases of boys and girls. (Tables VI, VII).

Correlation between the four reading tests and measurement of intelligence was significant and fairly consistent except where previously discussed. Relationship indicated with the auditory tests is discussed under various headings in the following section.

AUDITORY TESTS

Sentence Memory Span

Comparison of the means of boys and girls in the October administration of the Sentence Memory Span revealed a significant difference at .05 level of confidence in favor of the girls with a critical ratio of ± 2.35. This difference, still present but not significant, was found on the May administration of this test where the critical ratio was ± 1.73. (Table III, 1, 6, I). Both boys and girls showed significant growth at the .01 level when comparison was made between the October and May tests resulting in t ratios of ± 3.69 and ± 2.97. (Table IV, 11, A, B). A fairly high degree of reliability was indicated by the correlation of .77 between the two administrations of the test. Correlations between the October administration of the Sentence Memory Span and the four reading tests were significant at the .01 level: Neale (Oral) .45, Gates: PWR .38, PSR .40 and PPR .44. Even higher correlation with the second administration of

TABLE IV

COMPARISON OF MEANS ON AUDITORY TESTS

ADMINISTERED IN OCTOBER AND MAY

	Sentence Memory Span		Wepman Auditory Discrimination	
	Boys	Girls	Boys	Girls
	A	B	C	D
1. No. of Pupils	60	52	60	52
2. October Mean	11.73	13.59	48.55	50.36
3. May Mean	13.28	14.63	56.30	55.09
4. Standard Deviation on October Test	4.14	4.26	7.68	8.53
5. Standard Deviation on May Test	4.41	3.90	4.33	5.52
6. Standard Error on October Test	.53	.59	.99	1.18
7. Standard Error on May Test	.57	.54	.56	.77
8. Observed Difference	1.55	1.04	7.75	4.63
9. Correlation between October and May Test	.71	.84	.19	.38
10. Standard Error of the Difference	.42	.35	1.02	1.13
11. t Ratio	3.69 *	2.97 *	7.59 *	4.10 *

* Significant at the .01 level of confidence

the test was noted: Neale (Oral) .59, Gates: PWR .47, PSR .44 and PDR .5[illegible] (Table V, A, [illegible], [illegible], [illegible], [illegible], Q, [illegible]). A lower relationship between Auditory Memory Span and the four reading tests for boys is suggested by the following correlations: Boys Neale (Oral) .[illegible]4, Gates: PWR .3[illegible], PSR .31 and PDR .30; girls Neale (Oral) .50, Gates: PWR .45, PSR .45, PDR .55. (Tables VI, VII, 4, O, P, Q, R). It is possible that the lag in auditory development evidenced by the significant difference between the means of boys and girls on the Sentence Memory Span Test may be one of the contributing causes of the differences in reading results. (Table II, 1, 2, 3, 4, I). The higher correlation between the Sentence Memory Span and reading results for girls suggests that girls make more use of auditory memory in learning to read. Possibly boys need more training in this area. When examination was made of the means of the October and May tests is was found that although the boys showed more improvement than the girls they had not in May equalled the girls' mean in October: boys 13.28, girls 13.59. (Table IV, 2, 3, A, B). More research is needed to determine how much of auditory memory is innate, trainable and developmental.

Auditory Fusions

No significant differences were seen between boys' and girls' means on the Auditory Fusion Tests in either October or May. (Table III, 1, H, I). Correlations of the first test with the other auditory tests and with the reading tests were not significant (Table V, 5). However, correlation of the second Auditory Fusion Test with the reading tests were

TABLE V

INTERCORRELATION OF INTELLIGENCE, AUDITORY AND READING TESTS FOR THE TOTAL GROUP

N - 112

Tests Correlated	A Chronological Age	B D.B.F.G. M.A.	C D.B.F.G. I.Q.	D October Sentence Memory	E Auditory Fusion	F Wepman Aud. Disc.	G Story Memory	H Phonic Memory Span	I May Sentence Memory	J Wepman Aud. Disc.	K Spelling (Neale)	L Alph. Naming	M Alph. Sound	N Fusion (Neale)	O Neale (Oral Read.)	P Gates PWR	Q Gates PSR	R Gates PPR	S D.A.F.G. M.A.	T D.A.F.G. I.Q.
1. Chronological Age		.10	-.33	-.14	.06	-.08	-.12	-.01	-.20	-.09	-.13	-.18	-.04	-.01	-.12	-.15	-.08	-.09	.01	-.54
2. Detroit Beginning First Grade Mental Age			.90	.58	.32	.48	.37	.47	.47	.30	.34	.28	.22	.34	.39	.40	.46	.42	.66	.48
3. Detroit Beginning First Grade I.Q.				.61	.29	.48	.40	.45	.53	.31	.40	.33	.23	.32	.42	.45	.48	.43	.57	.69
October 4. Sentence Memory Span					.26	.43	.39	.49	.77	.29	.36	.26	.19	.24	.45	.38	.40	.44	.44	.45
5. Auditory Fusion						.17	.19	.24	.19	.18	.12	.14	.09	.30	.17	.19	.14	.15	.09	.04
6. Wepman Auditory Discrimination							.37	.36	.42	.28	.38	.30	.21	.37	.45	.42	.44	.45	.40	.39
7. Auditory Story Memory								.15	.34	.24	.26	.22	.05	.05	.31	.16	.30	.20	.34	.35
8. Phonic Memory Span									.47	.31	.25	.12	.23	.23	.36	.31	.33	.35	.35	.34
May 9. Sentence Memory Span										.32	.36	.28	.25	.28	.52	.47	.44	.52	.42	.47
10. Wepman Auditory Discrimination											.26	.12	.21	.22	.29	.21	.27	.30	.22	.26
11. Spelling (Neale)												.47	.49	.30	.66	.64	.62	.64	.40	.44
12. Alphabet Naming													.61	.52	.39	.50	.40	.46	.32	.32
13. Alphabet Sound														.51	.49	.49	.38	.46	.27	.26
14. Fusion (Neale)															.39	.41	.36	.43	.29	.24
15. Neale (Oral Reading)																.74	.67	.74	.41	.45
16. Gates PWR																	.72	.77	.49	.51
17. Gates PSR																		.78	.48	.46
18. Gates PPR																			.51	.49
19. Detroit Advanced Mental Age																				.75

Significant at the .01 level ———

Significant at the .05 level ———

significant at the .01 level: [illegible] ([illegible]) .[illegible], [illegible]: [illegible] .[illegible], [illegible] .[illegible], [illegible] .[illegible]. Correlation was also significant with some of the other auditory tests at the .01 level for the administration in October of Wepman .37, Sentence Memory Span, administered in May, .2[illegible], and Spelling .[illegible]. Highest correlation was seen with Alphabet Naming .52 and Alphabet Sounds .51. Apparently somewhat the same ability is used in these three tests. Tape recording the sounds to be fused so that each child would hear exactly the same sound with the same time interval would make this test much more accurate.

The Wepman Discrimination Test

Examination of the first administration of Wepman Discrimination Test results revealed a difference between the means of the boys and girls in favor of the girls, which was not statistically significant. This difference in means, still not statistically significant, was in favor of the boys on the May results of this test. (Table III, 3, 7, I). It would appear from this test result, that the boys as a group at the end of the first year were equally good, if not better, than the girls in auditory word discrimination. When examination was made of the improvement in auditory discrimination for boys and girls separately, the increase was significant at the .01 level for both boys and girls with the boys making a significantly greater improvement than girls.

It is possible that this test recorded on tape might yield different results because administration was far from standard. The enunciation of the examiner and the ability of the child to comprehend what was expected

TABLE VI

INTERCORRELATION OF INTELLIGENCE, AUDITORY
AND READING TESTS FOR THE BOYS

N - 60

Tests Correlated	Chronological Age	D.B.F.G. M.A.	D.B.F.G. I.Q.	October Sentence Memory	Auditory Fusion	Wepman Aud. Disc.	Story Memory	Phonic Memory Span	May Sentence Memory	Wepman Aud. Disc.	Spelling (Neale)	Alph. Naming	Alph. Sound	Fusion (Neale	Neale (Oral Reading)	Gates PWR	Gates PSR	Gates PPR	D.A.F.G. M.A.	D.A.F.G. I.Q.
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1. Chronological Age		.07	-.40	-.13	.11	-.22	-.01	-.15	-.20	-.21	-.23	-.30	-.31	-.15	-.23	-.32	-.14	-.16	.05	-.60
2. Detroit Beginning First Grade Mental Age			.88	.54	.41	.45	.58	.42	.38	.31	.26	.39	.11	.28	.27	.28	.42	.38	.65	.45
3. Detroit Beginning First Grade I.Q.				.56	.33	.51	.54	.46	.44	.38	.35	.48	.24	.31	.36	.40	.46	.42	.57	.68
October 4. Sentence Memory Span					.30	.37	.45	.51	.71	.33	.24	.27	.08	.21	.34	.30	.31	.30	.44	.40
5. Auditory Fusion						.39	.32	.04	.17	.15	.14	.09	-.14	.15	.01	.07	.09	.09	.24	.11
6. Wepman Auditory Discrimination							.54	.35	.31	.19	.31	.45	.20	.51	.32	.35	.28	.32	.37	.43
7. Auditory Story Memory								.28	.29	.26	.14	.24	-.02	.14	.31	.17	.31	.20	.45	.35
8. Phonic Memory Span									.49	.39	.19	.10	.11	.10	.32	.25	.34	.28	.34	.40
May 9. Sentence Memory Span										.34	.26	.31	.19	.30	.49	.43	.33	.41	.41	.44
10. Wepman Auditory Discrimination											.22	.18	.21	.17	.21	.15	.29	.34	.28	.40
11. Spelling (Neale)												.52	.59	.38	.67	.73	.59	.64	.44	.50
12. Alphabet Naming													.63	.60	.50	.60	.45	.57	.48	.49
13. Alphabet Sound														.55	.56	.57	.41	.57	.29	.42
14. Fusion (Neale)															.37	.35	.37	.54	.41	.41
15. Neale (Oral Reading)																.79	.63	.72	.50	.57
16. Gates PWR																	.71	.73	.49	.59
17. Gates PSR																		.77	.52	.50
18. Gates PPR																			.62	.58
19. Detroit Advanced Mental Age																				.74

Significant at the .01 level ———
Significant at the .05 level — — —

of din greatly affected the results. On the second administration of the test noise level was also a factor as an addition was being added to the building where testing was being carried on.

No doubt these factors also affected the correlation between the two administrations of the test, .[illegible], a very low correlation for reliability. However, auditory discrimination would appear to be less innate than auditory memory. More effort has been made to train this ability and as Murphy (1943) has pointed out, differences between boys and girls tend to disappear when training is given.

Correlation with reading results of the October administration of the Wepman Discrimination Test yielded the following results significant at the .01 level: Neale (Oral) .45, Gates PWR .38, PSR .40, PPR .44. On the Wepman test administered in May correlations were much lower, Neale (Oral) .29, Gates: PWR .21, PSR .27, PPR .30. (Table V, 6, 10, O, P, Q, R) Correlations with the boys' reading results appear to be much lower in both cases than the girls. For boys the October and May correlations of reading results were: Neale (Oral) .32, .21, Gates PWR .35, .15, PSR .28, .29 and PPR .32, .34 while the girls' correlations for October and May were: Neale (Oral) .55, .43, Gates PWR .49, .31, PSR .63, .37, PPR .58, .35. (Table VI, VII, 6, 10, O, P, Q, R) Since the present primary reading program includes a well rounded training in several methods of work attack the boys may not have been making as much use of auditory discrimination in reading as girls were.

Story Memory

The Story Memory Test results showed a statistically significant difference between the means of boys and girls at the .05 level of significance. The girls' scores were the higher with a critical ratio of ± 2.47 which closely approaches the .01 level of confidence. On examination of the correlation of this test with the reading tests and the other auditory tests it was found that only two reading tests: the Neale (Oral) .31 and the Gates PSR .30 were significant at the .01 level with the total group, but four auditory tests: in October, Sentence Memory .39 and the Wepman Discrimination .37, in May Sentence Memory Span .34 and Spelling .26 were significant at the same level. (Table V, 7, G). In the case of the boys .01 level of significance was reached only with October administration of the Sentence Memory Span .45 and the Wepman Discrimination .54. (Table VI, 4, 6, G). The girls' scores in Story Memory failed to correlate at the .01 level of confidence with any of the other auditory tests. Correlation of the boys' scores on Story Memory with Mental Age were .58 and Intelligence Quotient .54, while the correlation of the girls' scores were Mental Age .14 and Intelligence Quotient .21. (Tables VI, VII, 2, 3, G). This may be an indication that with boys listening ability is correlated more highly with intelligence than with girls. The boys who are accustomed to listening may be the ones who can hear differences and likenesses, repeat what they hear and reproduce stories. Some girls, on the other hand, may have a tendency to verbalize, that is, repeat words and ideas with a parrotlike fluency, but lack clear concepts of the ideas they utter. Apparently the girls most successful in

TABLE VII

INTERCORRELATION OF INTELLIGENCE, AUDITORY AND READING TESTS FOR THE GIRLS

N-52 Tests Correlated	Chronological Age A	D.B.F.G. M.A. B	D.B.F.G. I.Q. C	October Sentence Memory D	Auditory Fusion E	Wepman Aud. Disc. F	Story Memory G	Phonic Memory Span H	May Sentence Memory I	Wepman Aud. Disc. J	Spelling (Neale) K	Alph. Naming L	Alph. Sound M	Fusion (Neale) N	Neale (Oral Read.) O	Gates PWR P	Gates PSR Q	Gates PPR R	D.A.F.G. M.A. S	D.A.F.G. I.Q. T
1. Chronological Age		.16	-.21	-.04	.01	.13	-.17	.14	-.11	-.02	.13	.18	.38	.18	.13	.16	.17	.15	.17	-.41
2. Detroit Beginning First Grade Mental Age			.92	.65	.25	.51	.14	.52	.60	.30	.45	.11	.34	.40	.51	.55	.56	.48	.67	.52
3. Detroit Beginning First Grade I.Q.				.66	.26	.45	.21	.45	.63	.29	.42	.05	.19	.34	.45	.49	.50	.41	.60	.69
4. October Sentence Memory Span					.25	.47	.26	.51	.84	.31	.44	.20	.28	.31	.50	.45	.45	.55	.48	.49
5. Auditory Fusion						-.01	.09	.38	.23	.20	.11	.24	.30	.45	.32	.32	.23	.23	-.05	-.02
6. Wepman Auditory Discrimination							.15	.37	.53	.38	.44	.06	.21	.22	.53	.49	.63	.58	.44	.33
7. Auditory Story Memory								.02	.36	.30	.31	.14	.09	-.05	.22	.10	.19	.10	.24	.32
8. Phonic Memory Span									.47	.24	.34	.18	.34	.37	.43	.39	.37	.46	.37	.28
9. May Sentence Memory Span										.36	.43	.17	.29	.27	.51	.51	.58	.63	.45	.49
10. Wepman Auditory Discrimination											.39	.09	.25	.26	.43	.31	.37	.35	.16	.17
11. Spelling (Neale)												.37	.36	.22	.61	.52	.61	.59	.38	.32
12. Alphabet Naming													.61	.40	.22	.31	.23	.23	.03	-.07
13. Alphabet Sound														.47	.42	.38	.32	.31	.25	.02
14. Fusion (Neale)															.45	.50	.40	.34	.12	.01
15. Neale (Oral Reading)																.70	.67	.74	.37	.29
16. Gates PWR																	.77	.83	.49	.38
17. Gates PSR																		.77	.50	.38
18. Gates PPR																			.42	.33
19. Detroit Advanced Mental Age																				.80

Significant at the .01 level
Significant at the .05 level

learning to read and in making use of the other auditory abilities were not the ones who could repeat a story most easily.

Phonic Memory Span

The difference between the means of boys and girls on the test was not significant. (Table III, 5, I).

However, correlation of Phonic Memory Span with Mental Age .47, Intelligence Quotient .45, in October, Sentence Memory .49 and Wepman Discrimination .36, in May Sentence Memory .47 and Wepman Discrimination .31 were all significant at the .01 level. (Table V, H, 2, 3, 4, 6, I, J, 8). Correlations of Phonic Memory Span with the reading tests for the boys were: Neale (Oral) .32, Gates PWR .23, PSR .34, PPR .28, while the girls correlations were Neale (Oral) .36, Gates PWR .31, PSR .33, PPR .35, suggesting that the girls who could remember sounds might make slightly more use of them in word attack than boys. With more careful construction this test, if tape recorded, might produce more valid and significant results.

Spelling (Neale Auditory Discrimination Check)

This twelve word test of ability to apply phonetic knowledge in spelling revealed superiority of the girls at the .05 level with a critical ratio of $\pm$ 2.54 when the means of the boys and girls were compared. (Table III, 8, I). Boys' correlations in spelling with mental and auditory tests appear to be lower than the girls' and the total group. However, correlation between spelling and reading was consistently high. Correlations between spelling and reading results for the total group were: Neale (Oral) .66, Gates PWR .64, PSR .62, PPR .64.(Table V, 11, O, P, Q, R). Significant

correlation between ability in Alphabet Naming and Alphabet Sounds and Spelling, especially in the case of the boys were also noted: Alphabet Naming .52, Alphabet Sounds .59. The carry over of phonetic training from reading to spelling was no doubt responsible for the high correlation with reading but the low correlation for boys with auditory tests: Sentence Memory .24 and the Newman Discrimination .31, administered in October, Story Memory .14, Phonic Memory Span .19 suggests that boys make less use of auditory abilities in spelling than girls. Significant correlations were noticeable between ability in naming and sounding the letters of the alphabet and Spelling especially in the case of the boys: Alphabet Naming .52, Alphabet Sounds .59. Evidently the knowledge of the sounds given to individual letters was important both in spelling and reading yet Fusion both in October .12 and May .30 correlated very poorly with Spelling. (Tables V, VI, VII, 4, 5, 6, 7, 11, K, L, M).

Alphabet Naming

The girls were slightly better in their ability to name the letters of the alphabet than the boys but the observed difference of the means 1.24 letters failed to reach a significant level. However, it would appear that both boys and girls are learning their letters, the boys having a mean of 23.60 letters and the girls 24.84. (Table III 9, B, C, G). The examiner found that the letters giving difficulty were the ones least commonly used such as x, z and q. There was also a tendency to confuse such letters as b and d; q, p and g and also j and g. Correlation between alphabet naming and the other auditory tests in the case of the girls was negligible probably

TABLE VIII

MULTIPLE CORRELATIONS OF EACH OF THE READING TESTS WITH MENTAL AGE AND SENTENCE MEMORY SPAN AND WITH MENTAL AGE AND WEPMAN AUDITORY DISCRIMINATION

Tests	1 Neale 2 M.A. 3 Sent.Mem.Span	Gates PWR M.A. Sent.Mem.Span	Gates PSR M.A. Sent.Mem.Span	Gates PPR M.A. Sent.Mem.Span	Neale M.A. Wepman	Gates PWR M.A. Wepman	Gates PSR M.A. Wepman	Gates PPR M.A. Wepman
	A	B	C	D	E	F	G	H
1. Standard Deviation (1)	8.92	8.32	9.62	4.10	8.92	8.32	9.62	4.10
2. r_{12}	.39	.40	.46	.42	.39	.40	.46	.42
3. r_{13}	.45	.38	.40	.44	.45	.42	.44	.45
4. r_{23}	.58	.58	.58	.58	.48	.48	.48	.48
5. $r_{13.2}$	.29	.20	.18	.26	.32	.29	.41	.32
6. Standard Error of Estimate	7.85	7.49	8.36	3.60	7.80	7.32	8.64	3.52
7. Multiple Coefficient of Correlation	.48	.44	.50	.48	.49	.48	.44	.50

due to the fact that most girls knew their letters. (Table VII, [illegible]). Correlations with Spelling and reading tests were significant at the .01 for boys, girls and total group. (Tables V, VI, VII, 11, 12, L, O, P, Q, R). High correlation of Alphabet Naming with Alphabet Sound .61 and Fusion .52 was also shown. (Table V, 12, [illegible], N).

Alphabet Sounds

This isolation of the phonetic sounds from words is frowned upon by many authorities. It is felt that this is a meaningless procedure. However, apparently the sounds are being taught and children do associate the sound with a letter even though most teachers do not present sounds divorced from words. Girls were only slightly better than boys in associating letter sound with symbol and the difference was not statistically significant. (Table III, 10, I). Correlation of the boys' scores on Alphabet Sound with Spelling .59, Fusion .55, Neale (Oral) .56, Gates PWR .57, PSR .41, PPR .57 suggested that boys may make more use of letter sounds than girls whose correlations were Spelling .36, Fusion .47 Neale (Oral) .42, Gates PWR .38, PSR .32, PPR .31. Although the lower correlations were probably due to the fact that most of the girls knew their sounds. (Tables VI, VII, 13, O, P, Q, R).

MULTIPLE CORRELATIONS OF SELECTED TESTS

The multiple correlations of each of the four reading tests with Mental Age and the Sentence Memory Span Test were Neale (Oral) .48, Gates PWR .44, PSR .50, PPR 48 (Table VIII, 7, A, B, C, D). These were all significant at the .01 level and were slightly higher than the

TABLE IX

INTERCORRELATION OF THE AUDITORY SECTION OF THE
MURPHY-DURRELL READING READINESS TEST WITH
INTELLIGENCE, AUDITORY AND READING
TESTS FOR THE TOTAL GROUP

N - 62

Tests Correlated	Murphy-Durrell	D.B.F.G. M.A.	D.B.F.G. I.Q.	October Sentence Memory	Wepman Auditory Disc.	May Neale (Oral Reading)	Gates PWR	Gates PSR	Gates PPR
	A	B	C	D	E	F	G	H	I
1. Murphy-Durrell		.17	.28	.34	.26	.45	.40	.29	.22
2. Detroit Beginning First Grade Mental Age			.89	.57	.51	.31	.40	.44	.43
3. Detroit Beginning First Grade I.Q.				.62	.59	.41	.57	.52	.48
4.; October Sentence Memory Span					.52	.48	.49	.37	.46
5. Wepman Auditory Discrimination						.47	.61	.58	.54
6. May Neale (Oral Reading)							.73	.59	.74
7. Gates PWR								.73	.80
8. Gates PSR									.77
9. Gates PPR									

Significant at the .01 level ______

Significant at the .05 level ______

correlations with reading obtained from either Mental Age or Sentence Memory alone.

Similar multiple correlations of the four reading tests with Mental Age and the Wepman Discrimination Test are [illegible] (Oral) .4[illegible], Gates PPR .40, [illegible] .[illegible], PDR .50. (Table VIII [illegible], D, E, G, H).

Prognosis of success is only slightly higher in estimate than when the two correlations were taken separately but the relationship is more significant.

The Murphy Durrell Reading Readiness Test, Auditory Section

The differences in means and the correlations were computed for the scores of the sixty-two pupils selected randomly from the total group of one hundred twelve children who participated in the Murphy-Durrell Reading Readiness Test. The test items selected for this computation were the Auditory Section of the Murphy-Durrell Reading Readiness Test, Mental Age and Intelligence Quotient from the Detroit Beginning First Grade Intelligence Test, the October administration of the Sentence Memory Span Test and the Wepman Discrimination Test and the four reading tests. When comparison of these computations were made with similar items for the larger sample, interesting differences due to the difference in size of sample were observed. (Tables II, III, V, VI, VII, IX, X, XI, XII).

The correlations obtained between the Murphy-Durrell Test and Mental Age and Intelligence Quotients as measured on the Detroit Beginning First Grade Intelligence Test were .17 and .28 denoting negligible correlation with Mental Age and .05 significance with Intelligence Quotient

TABLE X

INTERCORRELATION OF THE AUDITORY SECTION OF THE MURPHY-DURRELL READING READINESS TEST WITH INTELLIGENCE, AUDITORY AND READING TESTS FOR BOYS

N - 33

Tests Correlated	Murphy-Durrell	D.B.F.G. M.A.	D.B.F.G. I.Q.	October Sentence Memory	Wepman Aud. Disc.	May Neale (Oral Reading)	Gates PWR	Gates PSR	Gates PPR
	A	B	C	D	E	F	G	H	I
1. Murphy-Durrell		.12	.23	.32	.19	.34	.39	.19	.07
2. Detroit Beginning First Grade Mental Age			.89	.62	.66	.35	.48	.52	.54
3. Detroit Beginning First Grade I.Q.				.65	.70	.51	.62	.59	.56
4. October Sentence Memory Span					.57	.46	.54	.35	.43
5. Wepman Auditory Discrimination						.47	.70	.57	.55
6. May Neale (Oral Reading)							.78	.59	.73
7. Gates PWR								.73	.78
8. Gates PSR									.79
9. Gates PPR									

Significant at .01 level ______

Significant at .05 level ______

(Table IX, 1, B, C). Correlations of Sentence Memory .34 and the Wepman Discrimination .26 with the Murphy-Durrell were significant at the .01 and the .05 levels respectively. (Table IX, 1, D, E). Correlations of this test with the reading tests were: Neale (Oral) .45, Gates PWR .40, PSR .29. PPR.22. (Table IX, 1, F, G, H, I). Apparently correlations of the auditory skill tested, i.e., the ability to recognize similarities and differences in the sounds of words, is more closely correlated with the word recognition factors needed for oral reading and single word recognition than the more complicated skills of comprehension required in the Gates PSR and PPR. The auditory skill tested here did not correlate significantly with intelligence or the other auditory tests and appears to be a perceptual skill needed in word attack. The los correlation between it and the Wepman Discrimination Test .26 suggests there is little similarity between the auditory skills tested by the two tests although both are testing auditory discrimination.

Significant differences were found in comparing the means of boys and girls on the Murphy-Durrell Test. The observed difference was 14.41 with a critical ratio of ± 4.36 which was very significant at the .01 level of confidence. Murphy, in her experiment using the same test, found that the difference disappeared with training. Since retesting was not attempted this was not proved in this case but training was given. However, boys must begin reading with a lag in the auditory ability tested by the Murphy-Durrell Reading Readiness Test. This may possibly be a factor in the differences in reading results between boys and girls.

Comparison of reading means for the Gates PPR for boys and girls

TABLE XI

INTERCORRELATION OF THE AUDITORY SECTION OF THE MURPHY-DURRELL READING READINESS TEST WITH INTELLIGENCE, AUDITORY AND READING TESTS FOR GIRLS

N - 29

Tests Correlated	Murphy-Durrell	D.B.F.G. M.A.	D.B.F.G. I.Q.	October Sentence Memory	Wepman Aud. Disc.	May Neale (Oral Reading)	Gates PWR	Gates PSR	Gates PPR
	A	B	C	D	E	F	G	H	I
1. Murphy-Durrell		.27	.29	.25	.29	.45	.31	.27	.32
2. Detroit Beginning First Grade Mental Age			.90	.51	.28	.32	.47	.34	.29
3. Detroit Beginning First Grade I.Q.				.57	.39	.30	.47	.35	.33
4. October Sentence Memory Span					.38	.43	.35	.30	.44
5. Wepman Auditory Discrimination						.45	.43	.57	.46
6. May Neale (Oral Reading)							.69	.55	.75
7. Gates PWR								.73	.82
8. Gates PSR									.73
9. Gates PPR									

Significant at the .01 level ______

Significant at the .05 level ______

for the group taking the Murphy-Durrell test showed an observed difference of 1.9 and a critical ratio of ± 2.04 significant at the .05 level not the .01 level as was shown in the case of the larger sample, where the observed difference was 1.95 and the critical ratio ± 2.60. (Table XII, II 9, 4, G, I) The other comparisons of reading means were similar in significance level reached to those of the larger sample.

Failure to reach significance level was seen in the smaller sample with the Sentence Memory Span Test where the observed difference of 1.83 secured a critical ratio of ± 1.77. The larger sample with an observed difference of 1.86 reached significance at the .05 level with a critical difference of ± 2.35. (Table XII, III .14, G, I) The observed differences in means were almost identical in both cases.

This comparison shows clearly why there are inaccuracies in the results obtained by many investigators of auditory abilities when the samples are too small. Further investigation of larger samples is necessary.

AUDITORY ACUITY

Massachusetts Hearing Test

The possibility of low scores in auditory discrimination and memory resulting from lack of auditory acuity was investigated by the use of the sweep test for hearing. Forty children were selected from the total group who scored below the class mean on most of the auditory tests administered in October, or who in the opinion of their teacher exhibited hearing difficulty symptoms.

TABLE XII

COMPARISON OF THE MURPHY-DURRELL READING READINESS TEST, AUDITORY SECTION, INTELLIGENCE, AUDITORY AND READING RESULTS FOR THE RANDOM SAMPLE WITHIN THE GROUP

No. of Pupils Boys 33 Girls 29 Total 62

Name of Test		Means			Standard Deviations			Comparison of Means of Boys and Girls		
	Date Given	Total	Boys	Girls	Total	Boys	Girls	Observed Differences	Standard Error of Differences	Critical Ratio
		A	B	C	D	E	F	G	H	I
1. Murphy-Durrell	Oct.	32.19	25.45	39.86	22.71	24.25	17.98	14.41	3.33	±4.36*
2. Detroit Beginning First Grade Mental Age	Sept.	86.10	85.90	86.30	9.40	10.20	8.40	.40	2.36	± .17
3. Detroit Beginning First Grade I.Q.	"	117.6	116.0	119.40	13.7	14.60	12.50	3.40	6.46	± .53
4. Sentence Memory Span	Oct.	12.82	11.96	13.79	4.19	4.25	3.91	1.83	1.03	±1.77
5. Wepman Auditory Discrimination	"	51.69	50.48	53.06	7.36	7.94	6.36	2.58	1.82	±1.42
6. Neale (Oral Reading)	May	26.01	22.81	29.65	9.65	7.85	10.21	6.84	2.34	±2.92*
7. Gates PWR	June	36.85	35.48	38.41	7.45	7.76	6.76	2.93	1.84	±1.59
8. Gates PSR	"	35.40	32.60	38.58	8.77	10.03	5.55	5.98	2.03	±2.94*
9. Gates PPR	"	19.64	18.75	20.65	3.83	3.97	3.39	1.90	.93	±2.04**

* Significant at the .01 level of confidence
** Significant at the .05 level of confidence

The Maico Individual Audiometer Test

Of the forty children tested, thirteen children appeared to have difficulty and were given individual audiometer tests. Of this group of thirteen, five children exhibited some signs of twenty per cent hearing loss at one or more frequencies but all were within the range of only slight hearing loss. There was no pattern of high frequency loss. Of these five children, two were very poor readers but there were other contributary causes. The child with the greatest difficulty had suffered ear infection after having taken the mental and auditory tests. Although her reading scores were adequate she had an extremely high intelligence and was possibly underachieving. The other two were also securing adequate reading scores. The degree of underachievement resulting from any hearing loss does not lend itself to statistical computation. Since only forty children out of the possible one hundred twelve were tested some children with auditory losses may have remained undetected.

One interesting fact noted in the individual audiometric testing of the thirteen children was that five audiograms showed a very high level of acuity in the speech area in one or both ears. It may be possible that children with acute hearing experience difficulty in auditory perception due to the distraction of hearing all sounds too clearly.

SUMMARY OF TEST RESULTS

Study of the assembled data revealed that certain conclusions could be reached concerning the auditory abilities of the group as a whole. Definite differences were seen on certain tests between the scores of boys

and girls in the experimental sample.

1. The boys were significantly older chronologically than the girls but intelligence was statistically equivalent for both girls and boys.

2. Reading results showed statistically significant differences at the .01 level between the means of boys and girls on three out of the four reading tests in favor of the girls. The test showing a difference, not significant statistically, was word recognition, the first reading skill to develop.

3. Only four of the auditory tests used showed significant differences between the means of boys and girls and only one of these was significant at the .01 level of confidence although the others approached this level. However, most of the tests showed significance in favor of the girls.

4. Tests of auditory memory and auditory discrimination used for testing in October and retesting in May showed that there was a significant improvement of scores indicating growth in auditory ability. Auditory memory appeared to be more innate than discrimination. The boys failed to reach the same level on the second testing as the girls attained on the first testing but the difference between means of boys and girls was not statistically significant in auditory memory. On the retest in auditory discrimination the boys showed greater improvement than the girls whom they surpassed but the difference did not reach statistical significance.

5. Correlation between all the variables used in the experiment gave evidence of significant relationship between most auditory skills, intelligence, and reading ability. In most cases the girls appeared to show higher relationship of intelligence and reading scores with auditory

abilities, [illegible]. The exceptions were found in the tests of auditory fusion and story memory. Auditory fusion showed low relationship with the other tests on the first test but correlated much more highly with reading on the second test of fusion. Story memory showed low relationship throughout [illegible]. Auditory discrimination as measured by the Murphy-Durrell Reading Readiness Test correlated poorly with intelligence but significantly with oral reading and word recognition.

6. Higher relationship, as a prognosis of reading success, resulted when the reading tests were correlated with Mental Age and Sentence Memory Span and also with Mental Age and the Wepman Discrimination Test.

7. The children in this experiment knew most of the sounds and letter names associated with the alphabet and on the average secured very adequate scores on all the reading tests. Consistent correlations were obtained between all four reading tests used in this experimental study.

SUMMARY

This chapter has presented the data obtained from this experimental study of the auditory abilities of the grade one group. It has attempted to show the relationship between these abilities, intelligence and reading results by the use of statistical computation. This statistical computation has been analyzed and explained. The implications and conclusions drawn from these findings will be presented in the final chapter.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This study has attempted to test the auditory abilities of a group of children during their first year of school in order to establish some relationship between these auditory abilities and the results of a grade one reading program.

The auditory abilities as defined within this experiment were auditory acuity, auditory discrimination and auditory memory. An attempt has been made to isolate these abilities with tests. Questions arise as to the precision of these tests and the interdependence of these abilities. A child cannot discriminate between words or sounds he cannot hear. Sounds he cannot hear he cannot remember. If he cannot discriminate between sounds his memory will reproduce a faulty semblance of what is said.

No thorough long-range study has been made available to educators explaining how children hear or how their hearing abilities mature. The three abilities defined in this study may be complemented by others, undefined, which greatly affect how well and how quickly children hear. Extreme acuity in hearing may cause distractions and frustrations because children cannot discriminate between meaningful sound and noise. Little is known, especially by educators, of the effects upon hearing of associational difficulties caused by minimal brain damage. Psychological deafness, though supposedly rare, may be more of a factor in learning than we presume. Listening has not as yet been widely investigated. Mental capabilities restrict what a child does with what he hears.

The complexity of the problems of hearing and difficulties in securing precise tests may cause the investigator to doubt the validity of the results obtained. However, in this study certain hypotheses have been tested and statistical data supports what appear to be valid conclusions.

CONCLUSIONS

HYPOTHESIS I

> There will be significant relationship between the scores on each of the tests of auditory memory and discrimination and the scores on oral and silent reading tests.

Correlations between each of the auditory tests and the four reading tests; oral reading, Neale Analysis of Reading Ability and the three silent reading, Gates Word Recognition, Sentence Reading and Paragraph Reading, were positive in all cases but with varying degrees of significance.

Auditory Memory

The Sentence Memory Span Test administered in October and readministered in May showed high significant correlation with the four reading tests. Correlation was greater between the second administration of the test and the reading results. High correlation between the two administrations of the test indicated a reliable test especially when the eight months time lapse between tests was considered. Innate factors, possibly intelligence, appeared to be present.

Sentence Memory Span, which is easily administered, may have diagnostic value in aiding teachers in early detection of speech difficulty, slowness in retaining instruction or possibly lack of

auditory acuity. High correlation with the auditory discrimination tests suggests that some mistakes were the result of faulty word discrimination, further evidence of the interdependence of auditory skills.

The Auditory Story Memory Span barely correlated significantly with oral reading as tested by the Neale Analysis of Reading Ability and silent reading as tested by the Gates Sentence Reading Test. It failed to reach a significant level of correlation with the other two reading tests.

Rapport was difficult to establish with this test and inhibiting factors such as timidity appeared to affect delayed auditory recall which Story Memory Span attempted to measure. Apparently verbal security and the ability to repeat story facts does not correlate highly with reading success at this level.

The Phonic Memory Span Test which attempted to measure memory for the phonetic sounds in unconnected sequence showed a significant level of correlation with the four reading tests. It is possible that this test with further revision might prove valid and useful in determining when memory for such sounds matures.

Memory for the names of the letters of the alphabet and their sounds showed significant relationship with the four reading tests. It is apparent that children in grade one are being taught the letter names and sounds. Some of the letters which appear less frequently in primary reading such as "z" and "q" were sometimes not remembered and reversal difficulties were seen in the mistakes made in identifying "b" and "d." Some confusion was also seen between "g" and "j" where sound and symbol are very similar. The divorcing of letter sound from the whole word as was done in testing memory for letter sounds is felt to be a meaningless procedure by most

present day reading authorities. However, although the children had been taught the sounds in combination with words most of them could isolate the sound.

Auditory Discrimination

The Wepman Word Discrimination Test administered in October recorded results which correlated significantly with the four reading tests and with most of the other auditory tests. However, this test readministered in May showed greatly reduced correlation with the four reading tests.

Correlation between the two administrations of the Wepman Word Discrimination Test was very low for reliability. Some difficulty was experienced in making sure the children understood what was required of them especially on the first test. There was also difficulty in maintaining the same uniform vocal production by the examiner for each administration. Tape recording the administration of the test might help to standardize procedures and yield a more reliable correlation. However, as other investigators, for example Murphy and Wepman, point out growth and training affect word and sound discrimination and these factors probably account for the low reliability factor. Auditory discrimination lacks the innate stability of auditory memory because scores in testing are affected by training and maturation.

The Auditory Section of the Murphy-Durrell Reading Readiness Test which was devised for the purpose of determining the ability of pupils to recognize similarities and differences in the sounds of words correlated significantly only with oral reading and word recognition. Apparently this auditory ability is concerned mostly

with word recognition and does not greatly affect the more complex skills of comprehension needed in sentence and paragraph reading. It is possible that context clues are used more frequently than sound discrimination as reading skill increases. Correlation between word discrimination and sound discrimination as tested by the Wepman and Murphy-Durrell tests was very low suggesting that two different types of discrimination were being tested. Retesting with the Murphy-Durrell Test was not attempted. The test requires a long time to administer and concentration of grade one pupils for this long period was difficult to maintain. It is possible that some of the errors in this test may not have been due to poor discrimination but to short concentration span.

The Betts Fusion Test administered in October showed only slight relationship with reading results. The Neale Fusion Test, very similar in design, administered in May, however, showed very significant correlation with all four reading tests. Correlation between the two tests was too low to show any degree of reliability between them. As has been pointed out, administration of the test was not consistent and probably if the administration had been tape recorded the results might show more reliability between tests. However, the higher degree of correlation obtained between the second test and reading results probably indicates that auditory fusion is a learned skill and not too important in pre-reading testing.

The auditory discrimination factor tested through simple spelling with the Neale supplementary diagnostic test of twelve words showed the highest correlation of any of the auditory tests. It was apparent that a common factor, probably skill in phonics, resulted in success in both

reading and spelling, at the grade one level.

Summary of Conclusions from Hypothesis I

It can be concluded that auditory memory for sentences,speech sound,and the names and sounds of the letters of the alphabet showed a significant relationship with oral and silent reading ability at the end of grade one. Delayed recall of auditorily related facts as measured by story telling showed much lower relationship than the other tests of auditory memory.

Auditory discrimination of words was significantly correlated with reading results when administered before reading began but correlation with reading results was greatly reduced with the May administration of the test. Auditory discrimination of sound in words reached a significant correlation only with oral reading and word recognition. The relationship between auditory fusion of sounds into words became significant after reading had been taught. Auditory discrimination through simple spelling reached a high level of correlation with both oral and silent reading.

It would appear that auditory memory is generally significant in its relationship with both oral and silent reading but that auditory discrimination, especially as training and maturation affect it, sometimes fails to reach significant relationship with reading tests.

HYPOTHESIS II

> There will be a significant relationship between the scores on each test of auditory memory and discrimination and intelligence scores as measured by a standardized primary intelligence test.

Correlation between all auditory tests, with exception of memory for the sound of the letters of the alphabet and discrimination of sound

within words as measured by the Auditory Section of the Murphy-Durrell Reading Readiness Test reached a significant relationship with intelligence scores as measured by the Detroit Beginning First Grade Intelligence Test.

Auditory Memory

The highest level of relationship was noted between Auditory Sentence Memory Span and intelligence. Correlation was somewhat lower on the second administration of this test but still seemed to indicate an innate factor in this auditory ability. Auditory Story Memory and Phonic Memory Span showed slightly lower but still significant relationship. While the still lower relationship of memory for the names and sounds of letters of the alphabet with intelligence may have been due to the fact that this was a learned skill. The fact that most individual intelligence tests include some test of auditory memory would further substantiate the relationship of auditory memory with intelligence.

Auditory Discrimination

As has been pointed out earlier Wepman (1960 - page 331) found a low correlation between intelligence and auditory word discrimination and felt that the positive relationship was due to the fact that the intelligent child was capable of greater concentration and so did better on the test. The second testing of the Wepman Word Discrimination Test showed greatly reduced correlation between auditory discrimination ability and intelligence. Less and less relationship between these two variables would probably result with successive testings of auditory word discrimination as this ability appears to be developmental and trainable. Auditory fusion of words showed little variation in the relationship between the two tests and

intelligence. In neither case was the relationship significant. Correlation between the Auditory Section of the Durrell-Sullivan Reading Capacity Test and intelligence showed negligible correlation. Auditory discrimination through simple spelling showed significant relationship.

Summary of Conclusions from Hypothesis II

Auditory memory appears to have a much closer relationship with intelligence than auditory discrimination. Correlation between auditory word discrimination and mental age appears to be greatly reduced on the second testing while correlation between sound discrimination was very low. Even if word discrimination and sound discrimination are different auditory factors, neither of them appear to be closely related to intelligence.

HYPOTHESIS III

> There will be a significant growth of both boys and girls in auditory memory and discrimination indicated by the means of scores obtained on October and May administration of the same tests for these abilities.

Significant differences in the growth of boys and girls were found when examination was made of the scores of Auditory Sentence Memory Span and the Wepman Word Discrimination Test administered in October and May.

Auditory Memory

When the October and May means for Sentence Memory Span were compared it was found that the boys showed a greater improvement than the girls but in May the boys had not quite reached the same mean score as the girls had attained in October. Correlation between the two testings gave evidence of test reliability. Comparison of means of boys and girls on the first test showed a slight significant difference in

favor of the girls. This difference was still present but no longer statistically significant on the second testing. It is possible that there is a lag in the development of auditory memory for boys which may be a contributing factor in the lower mean scores attained by boys noted in the reading test results in this experiment.

Statistical results support the conclusion that auditory memory span as tested by the repetition of increasingly difficult sentences is to a certain extent developmental, growth being indicated by a statistically significant increase in mean score for both boys and girls. The affect of training upon this auditory ability might be interesting to investigate.

Auditory Discrimination

In word discrimination as tested by the Wepman Word Discrimination Test a statistically significant difference in means between the October and May test results was also present. The first administration had shown differences not statistically significant in favor of the girls. The second administration of the test revealed a difference in favor of the boys. The boys made a greater improvement than the girls. Several factors may be responsible for this change. The boys were chronologically on the average almost two months older than the girls and maturation may have affected scores although chronological age does not correlate highly with the Wepman Word Discrimination Test. Exercises for training in auditory discrimination are included in the grade one manuals for reading and the boys have no doubt profited from this training. Boys previous to school entrance are usually more physically active than girls and tend to spend more time with children their own age or younger and therefore pay less

attention to listening and the careful enunciation of sounds. Girls, on the other hand, often have more contact with adults as they are more closely associated with their mothers and learn to follow directions doing simple duties about the house. It is possible that the change to the school situation of accurate enunciation and much listening affects boys more than girls.

Results of this testing would seem to indicate that boys at the end of the first year were equally good if not better than the girls in auditory word discrimination. This finding was somewhat contrary to expected results from this test. Examinations of medians for boys and girls failed to show that boys secured lower scores than girls in this ability.

Summary of Conclusions from Hypothesis III

It must be concluded that significant growth in both auditory word discrimination and auditory memory does take place during the first year of school. A further conclusion reached when this hypothesis is accepted, however, would be that boys begin reading when they are not as mature auditorily as girls and in consequence are not as ready to read.

HYPOTHESIS IV

> Girls will have significantly higher mean scores on each of the auditory tests of memory and discrimination than the boys and the girls' scores on the auditory tests will show a higher relationship with oral and silent reading.

In this experiment the boys and girls were found to be equivalent in intelligence but the girls were significantly younger chronologically than the boys. However, even with this advantage in chronological age most of the auditory differences were in favor of the girls at the

beginning of this experiment.

When comparison of the means of boys and girls on the four reading tests was made it was found that on the Neale Analysis of Reading Ability (Oral) and the Gates Sentence and Paragraph Reading (silent), the girls were significantly superior. However, on the Gates Word Recognition the observed difference was in favor of the girls but the difference was not statistically significant. Gates Word Recognition tests recognition of individual word meanings through linking words with pictures. As has been pointed out in chapter four, this lack of statistical difference probably indicates the average level of development reached by boys at this time of the first school year. They have not, as yet, learned to apply word recognition in sentence and paragraph comprehension as efficiently as the girls have.

It must be emphasized, however, that the mean scores on this test showed that both boys and girls were securing adequate reading instruction and experiencing success in reading when compared with the published norms for these tests.

When comparison was made of the difference between the means of boys and girls it was found that only one auditory test, The Auditory Section of the Murphy-Durrell Reading Readiness Test showed a highly significant difference in favor of girls. Auditory Sentence Memory Span administered in October, Auditory Story Memory and auditory discrimination as measured by the Neale Spelling Test showed slightly significant differences also in favor of girls. The differences in means between boys and girls on the other tests were not statistically significant. The two tests of Auditory Fusion, the Phonic Memory Span Test and the

[illegible] administration of the [illegible] Word Discrimination showed differences in favor of the boys that were insignificant.

However when examination of the relationship between total auditory ability as measured by these tests and reading results was made the boys appeared to make less use of auditory ability in learning to read than girls did.

Auditory Memory

There appeared to be higher relationship between girls' scores on the Auditory Sentence Memory Span Test and the four reading test results than between boys' scores and reading results on both administrations of the test. Correlation for girls on the first test of Sentence Memory Span reached a very high level of significance with reading scores and an even higher level with the second test. Boys' scores in Sentence Memory Span, on the other hand, were barely significant when correlated with reading results and though correlation with the second administration was much more significant it still appeared lower for boys than girls.

Auditory Story Memory apparently showed a higher correlation with reading results for the boys than girls but correlation was comparatively low for both groups. Since the girls had significantly higher means on this test it would appear, as has been mentioned, that the girls who could glibly repeat story facts were not the ones most successful in learning to read. It is possible since there is a low correlation of this test with intelligence that some girls tend to verbalize, that is, repeat loquaciously but fail to comprehend the facts they repeat.

In the case of the Phonic Memory Span, the boys' scores are barely statistically significant when correlated with reading tests while the girls'

scores are definitely significant when correlated with the reading tests. Apparently the girls who could remember the phonic sounds [illegible] of them than the boys or the girls developed memory for these sounds before the boys did. Memory for the sounds of the letters of the alphabet tested in May with visual stimulus showed higher correlation with reading for boys as did memory for the names of the letters of the alphabet. However correlation for boys may have been higher simply because most of the girls knew their alphabet names and sounds irregardless of reading ability while this was not true of the boys.

Auditory Discrimination

The Wepman Word Discrimination Test correlated with reading scores for girls upon the first administration but correlation appeared greatly reduced on the second administration. With the boys scores on the first administration the only reading score reaching a high level of correlation was the Gates Word Recognition and on the second administration only the Gates Paragraph Reading reached the same level. Correlation with the other reading tests varied from slight to barely significant for the boys.

Only slightly significant correlation between the Auditory Section of the Murphy-Durrell Reading Readiness Test and the Neale Analysis of Reading Ability (oral) was noted for the girls and with the Gates Word Recognition for the boys. The other reading tests failed to reach a significant level of correlation with this test of discrimination of sounds within words. It is possible, as with fusion, this test might show higher correlation with reading results later in the year.

Some doubt has been expressed by the investigator as to the

because of the word fusion test but correlation of the second test with reading results suggest that boys capable of fusing sounds may have used this skill in Gates Paragraph Reading as the correlation of boys Fusion scores with this test was particularly high. This test in reading requires a high level of comprehension and possibly auditory fusion may have aided in word attack.

Auditory discrimination through simple spelling scores resulted in high correlation with reading results for both boys and girls. Correlation was even higher for boys than girls.

Summary of Conclusions from Hypothesis IV

Girls do not appear to have consistently significantly higher means on all auditory test scores but they do begin reading with certain auditory advantages and apparently make more use of auditory abilities in learning to read. Auditory discrimination for the beginning and ending sounds within words was the only test showing a highly significant difference in means favoring the girls. Auditory memory as tested by increasingly difficult sentences and retelling story facts showed means that were higher for girls but the difference was only slightly significant statistically. None of the other auditory tests showed statistically significant differences in favor of either boys or girls. Testing in May showed that as the year progressed auditory differences between boys and girls tended to decrease.

Except in the second Auditory Fusion Test, Story Memory, Spelling and Alphabet Naming and Sounding the girls appeared to have higher correlations in auditory memory and discrimination tests with reading scores than did boys. High correlations between Auditory Sentence Memory and the Wepman Word Discrimination and reading results for girls were especially noted.

It would appear that girls begin school with greater skill in certain auditory abilities and make more use of these auditory abilities and these advantages may help them to begin reading more quickly than boys. Maturity and training appear to decrease auditory differences.

HYPOTHESIS V

> There will be a significant relationship between mental age as measured by a standardized primary intelligence test and the scores in oral and silent reading. However, when mental age and the scores for auditory memory and auditory discrimination are each correlated with the tests for oral and silent reading significance will prove to be greater than when mental age alone is used.

Correlation between Mental Age scores as calculated from the Detroit Beginning First Grade Intelligence Test and the scores of the Neale Analysis of Reading Ability (Oral) and the Gates Primary Word Recognition, Sentence Reading and Paragraph Reading (Silent) proved to be significant.

When multiple correlations were calculated with each of the reading test scores, Mental Age and each of the auditory tests of Sentence Memory Span and Wepman Word Discrimination a slightly higher correlation resulted than when reading results were correlated with Mental Age alone. The prognosis of reading success resulting from this correlation was only slightly higher in estimate than that resulting from a single test but a marked relationship with reading was indicated.

It is possible, however, that the value of the tests of auditory memory and discrimination lies not in prognosis but in diagnosis of difficulty. The Sentence Memory Span Test would help the teacher to become aware of speech defects early in the school year and aid in pointing out children who would require frequent repetition of instruction. It

might also indicate children with hearing acuity problems. The Wepman Word Discrimination would aid in differentiating children for special training in discrimination.

Summary of Conclusions from Hypothesis V

Multiple correlation of the scores of tests of auditory memory and auditory discrimination and mental age with the tests of oral and silent reading result in a slightly more significant relationship with reading than when mental age is used alone. However, the value of these tests probably lies in their diagnostic rather than in their predictive value.

HYPOTHESIS VI

> There will be some children with poor acuity among those who make low scores in auditory memory and discrimination and these children will experience some difficulty in learning to read.

Of the one hundred twelve children who took part in the experiment forty were selected who were below the class mean on most of the auditory tests administered in October. The teachers were also asked to suggest children they thought might be experiencing difficulty with hearing.

When these forty children were tested by the group auditory sweep test for hearing acuity, thirteen children showed some evidence of acuity problems. When these thirteen were tested individually five showed some hearing loss, five exhibited acute hearing within the speech range and three proved to have normal acuity. None of the hearing loss was severe. Losses up to twenty decibels were at one or more frequencies with only one ear. There was no pattern of high frequency loss. In the cases of extreme acuity discrimination problems may result from difficulty in

separating meaningful sound from noise. A habit of inattention may develop as a result of frustration and this would account for these children being among those who failed to pass the screening test for hearing acuity. It is also possible that these children have a different threshold for sound.

No attempt was made to correlate auditory acuity results but the reading results of the ten children mentioned in the previous paragraph were examined. Eight of the children were below the class mean on all four reading tests, one on three reading tests and one on one. Of the eight children five were below the class mean in intelligence level and three above. The child who had only one test above the class mean in reading was slightly below the class mean on the first intelligence test but above it on the second. The tenth child who fell below the class mean on only one reading test, had an extremely high intelligence level, and had scored highly on the first auditory tests but had suffered from ear infection during the term.

Statistical computation of the effect of auditory acuity upon reading could be calculated by using partial correlation and discounting the effect of intelligence, but there is some doubt as to whether intelligence scores are not affected by hearing ability. The resulting statistics may not show the total picture.

It is possible that other children with acuity difficulties might be found among the children who experienced little difficulty with auditory discrimination and memory. The affect of auditory acuity upon reading readiness needs much more extensive study than was possible in this experimental study.

<u>Summary of Conclusions from Hypothesis VI</u>

Auditory acuity apparently does affect the results of auditory discrimination and auditory memory testing and the results obtained suggest that extreme acuity may also affect the other auditory abilities. Both extreme acuity and loss of acuity may affect reading results. A more extensive study of auditory acuity is needed in order to study its affect upon reading readiness.

LIMITATIONS OF THIS STUDY

1. This study was limited to the children entering grade one at Gold Bar Elementary School as these were available for testing by the investigator. It is possible that this selection limited somewhat the the socio-economic level of the sample. However, since the school was large the sample was of a statistically satisfactory size and included the whole population available.

2. Time and the availability of the group audiometer included in the testing program made testing of the whole group for auditory acuity impossible but interdependence of the auditory abilities may have helped in the selection of the sample for this test. Individual audiometric testing of every child would have greatly added to the results of this experimental study.

3. Individual testing necessitated testing children at times when peak performance may not have been possible. Children were sometimes tested at periods near the end of the school day but the novelty of the test and the stimulation of individual attention may have offset fatigue.

4. The use of tape recordings of certain of the tests would have

greatly improved standardization of test procedure but it is possible that rapport might have been low between the machine and the child. Accurate testing of small children is very difficult.

5. There is need for improvement in the tests used for determining auditory discrimination and auditory memory. The test for discrimination of sound within words was too long and fatiguing for children at the beginning of the first year of school.

IMPLICATIONS OF THIS STUDY

1. It has been found that auditory memory shows increasing correlation with reading results whereas auditory discrimination reaches a point where correlation with reading results decreases due either to maturation or training during the first year of school. Further testing at frequent intervals during this period would possibly give a clearer picture of the growth pattern of these two auditory abilities.

2. A more significant relationship between auditory memory and intelligence was found than between auditory discrimination and intelligence. However, some dissatisfaction was felt with the intelligence tests used in this study. These two intelligence tests contain some rather antiquated picture concepts and although the visual areas are quite thoroughly tested there is little differentiation attempted. There is a need for a test of potential ability in various perceptual skills. Such a test would, by differentiation, show auditory and visual strengths and weaknesses. Possibly some test of tactual ability could also be attempted.

3. Examination of the scores of boys and girls on auditory tests and the correlations of these same scores with reading results suggest that girls begin school with an auditory advantage and make more use of auditory ability in learning to read. The implication would therefore be that there is a need to take this difference into account in teaching practices. Since the boys appear to reach a similar level in some auditory skills during the first year as girls the pacing and timing of certain phases of reading instruction affected by auditory skills should be taken into account.

4. Growth in both auditory memory and discrimination has been proved. Modern reading manuals provide definite training in auditory discrimination but no formal training in auditory memory is suggested. It seems possible that the effect of definite training might be an increase in memory span since research has proved that growth in discrimination is affected by training.

5. Multiple correlation of tests of auditory memory and discrimination with each of the reading tests resulted in a marked relationship with reading results. However the diagnostic rather than the predictive value of auditory memory and discrimination tests is suggested. Further testing with visual and tactile tests might further augment diagnostic practices at the grade one level and aid teachers in understanding the strengths and weaknesses of their pupils.

6. The most interesting implication arising from auditory acuity testing at this first year level was the problem of extreme acuity. It is possible some children are frustrated in learning not by lack of acuity but by intolerance for sound. This possibly needs investigation.

7. Little is actually known about the development of hearing acuity

and although this experiment did not find extreme hearing acuity problems among the children tested a need for further individual testing at this level and other levels seems obvious. A wide survey of hearing acuity is needed. Group sweep tests do not provide sufficient educational information nor are they completely accurate. Even individual testing for acuity is difficult.

8. Difficulties in auditory testing suggested that such problems as noise levels in the classroom and the teacher's voice production have educational implications. Research has shown children with high frequency deafness have difficulty in hearing some women's voices but easily hear a man's voice.

RECOMMENDATIONS FOR FURTHER STUDY

1. A thorough study of the development of auditory abilities of memory and discrimination should be attempted with repeated testing at definite intervals to determine the pattern of development in audition. Special attention might be paid to finding maturation levels when phonic training would be most effective.

2. A special study is needed in order to determine whether training can reduce the effect of delayed auditory maturity of boys on reading instruction. The pacing and timing of reading instruction to coincide with maturation of auditory abilities might arise from the first study suggested.

3. The development of a test of potential ability in various perceptual skills might be attempted through careful study of the abilities of vision, audition and possibly touch which would aid

teachers in determining the strengths and weaknesses of children entering the first grade. The present tests which produce only a single score do not differentiate or aid in determining methods of instruction.

4. A study is needed to determine the effect of definite training upon auditory memory. A matched control study where training for a definite period was given to one group and not another with testing before and after would determine whether this type of training should or could be given to primary children.

5. A similar type of study might be made to determine whether teachers are neglecting a possible instructional gain by excluding tactile learning from primary reading instruction.

6. A comprehensive study with individual audiometric testing of a large group of Canadian children is needed to determine the incidence of hearing acuity difficulties at the first grade level.

7. A comprehensive study with individual audiometric testing might also be attempted at different age levels to determine acuity development and its educational implications.

8. Extreme hearing acuity as it affects auditory memory and discrimination might be studied to determine how this may effect reading instruction.

9. A study should be made to consolidate medical, psychological and educational knowledge of the effect of associational and psychological difficulties on hearing. Experimental testing of brain damaged children might be attempted to add to this knowledge in the three aspects of audition.

10. Experimental studies of the effect of listening training at grade one level should be attempted and tests might be developed to determine

listening ability.

11. The relationship between auditory abilities, listening and intellectual level needs further investigation at the grade one level. New techniques in the repetition of oral instruction might be developed in order to improve instructional effectiveness with the slow learner.

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APPENDICES

DETROIT
BEGINNING FIRST-GRADE INTELLIGENCE TEST
(*Revised*)

By ANNA M. ENGEL, Assistant Director, Special Education, Detroit Public Schools,
and HARRY J. BAKER, Director, Psychological Clinic, Detroit Public Schools

NO. OF TEST	SCORE
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Last name.................. First name.................. Initial...Sex: M...F...

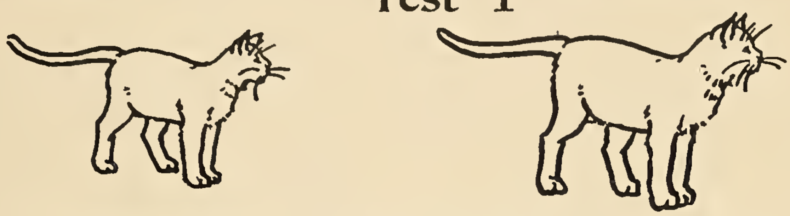
City...................... School...................... Birth date.............

Rating.................... Mental Age.................. IQ.....................

EXAMINATION: FORM A

Test 1

A



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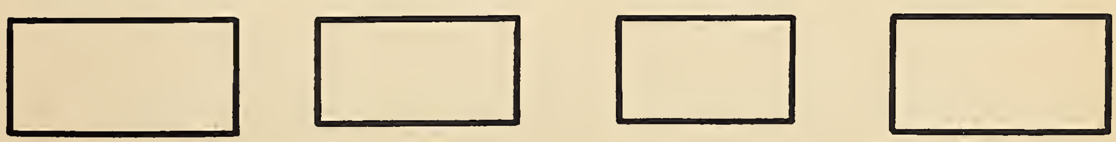

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PRINTED IN U.S.A. DBFGIT-22

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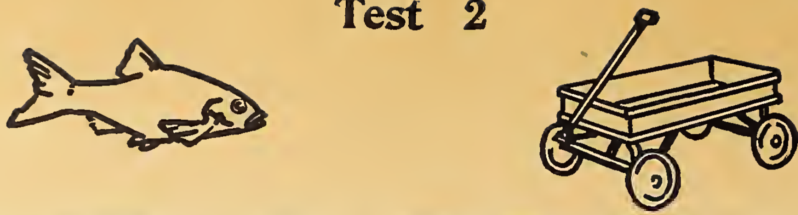

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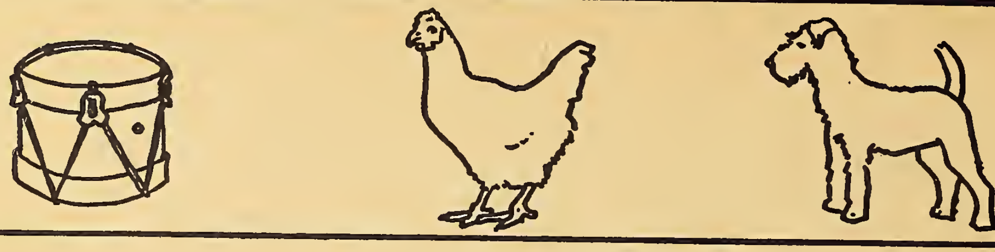

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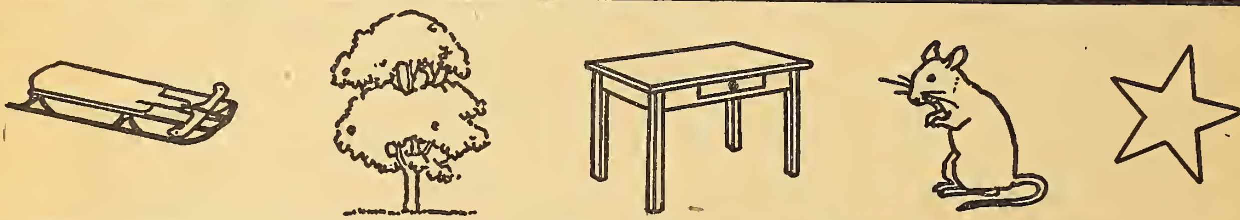

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Score . . . . .

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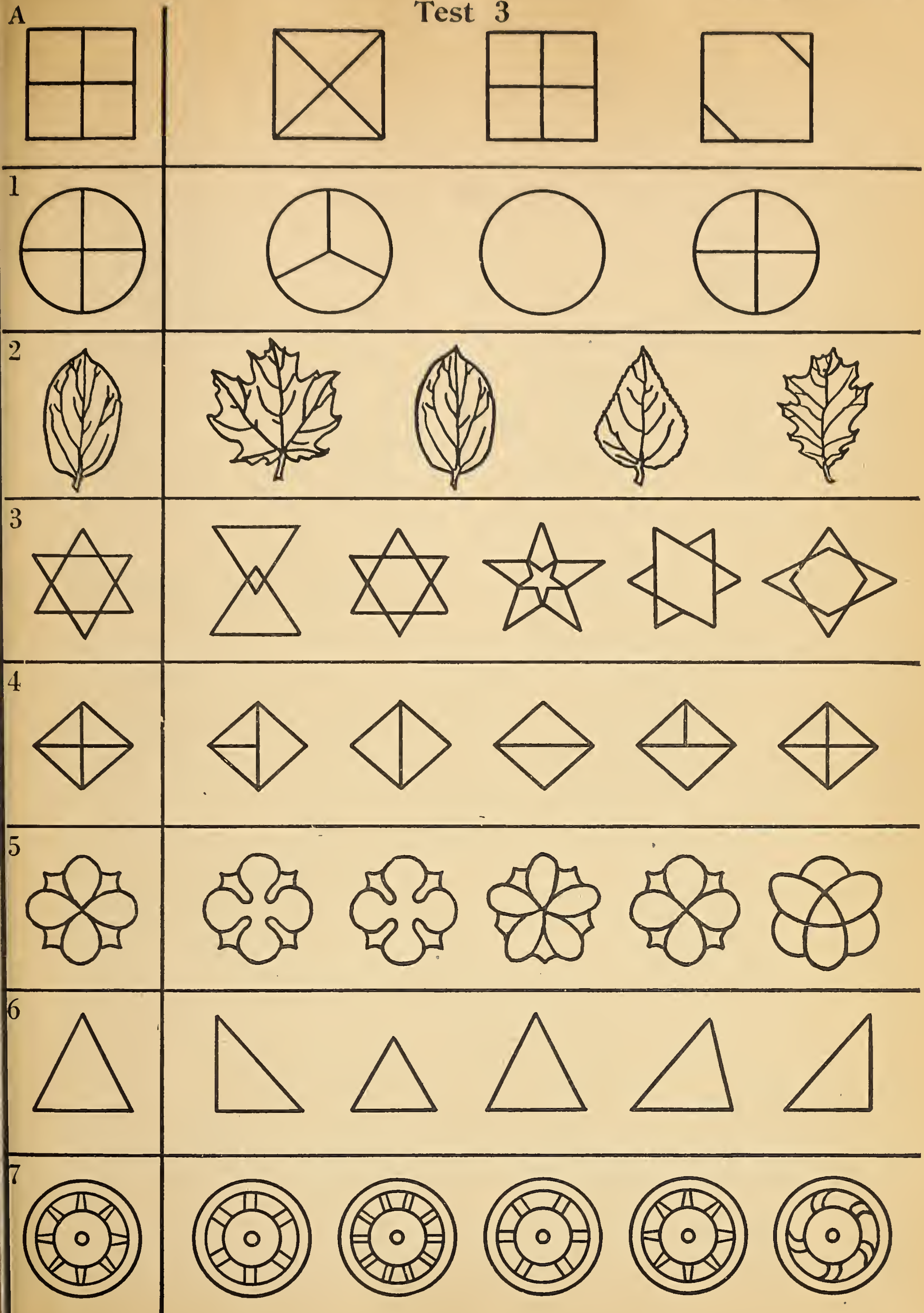

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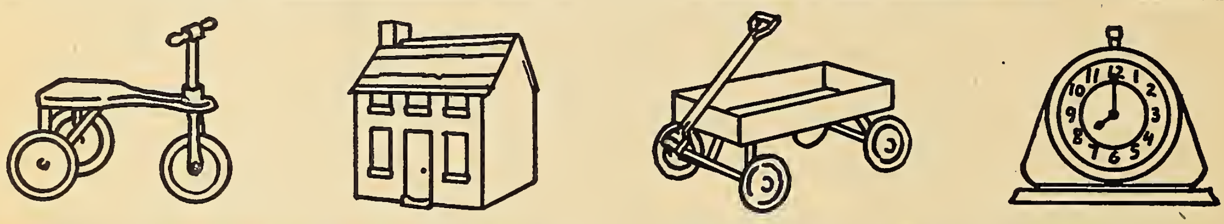

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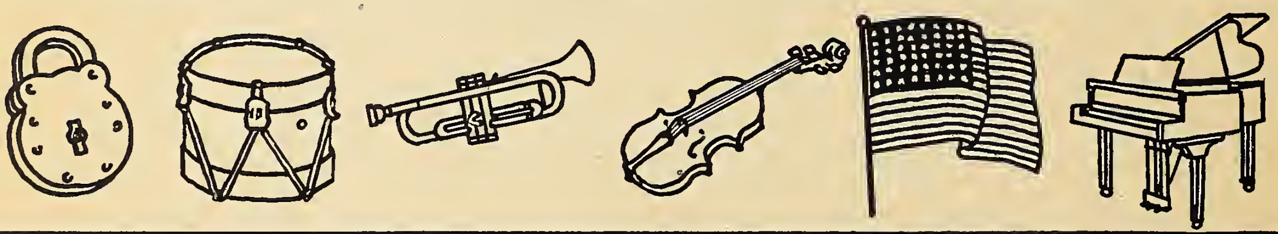

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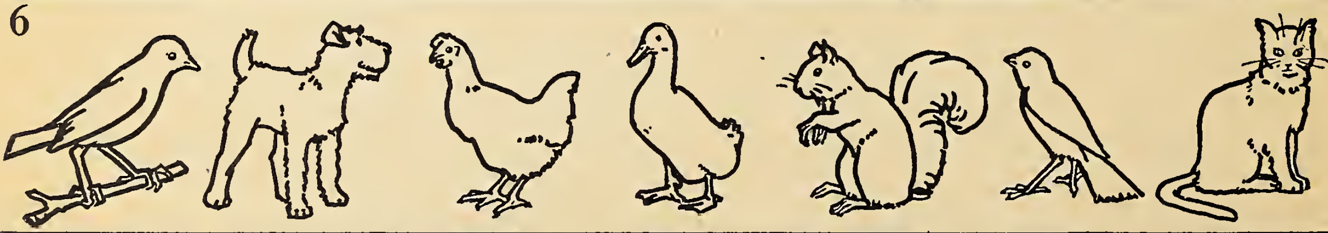

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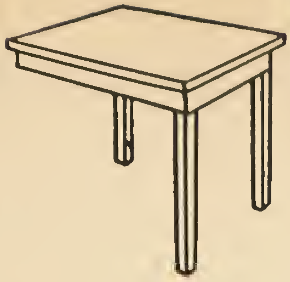

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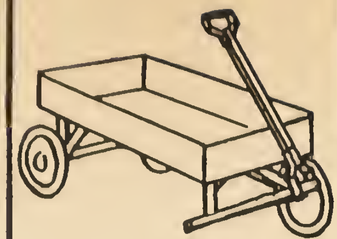

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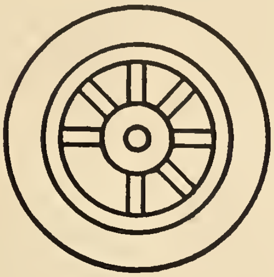

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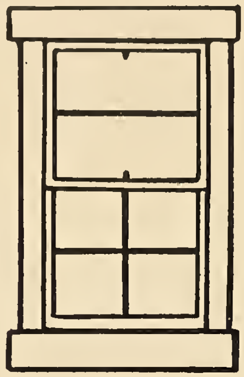

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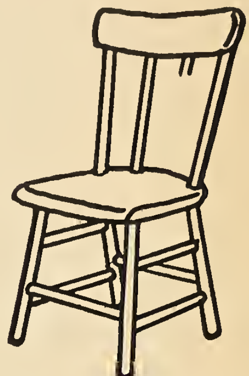

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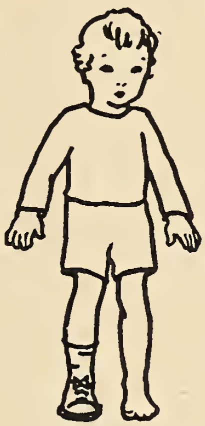

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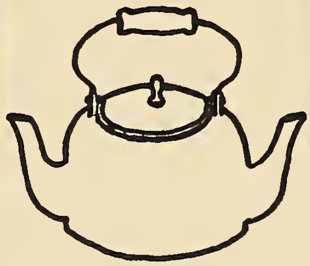

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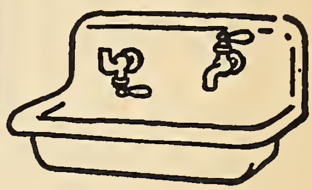

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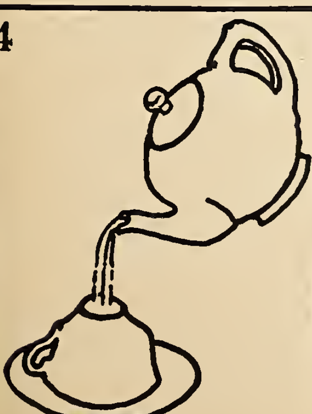

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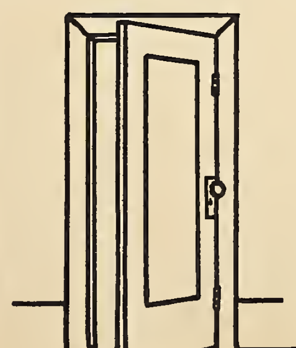

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Score ......

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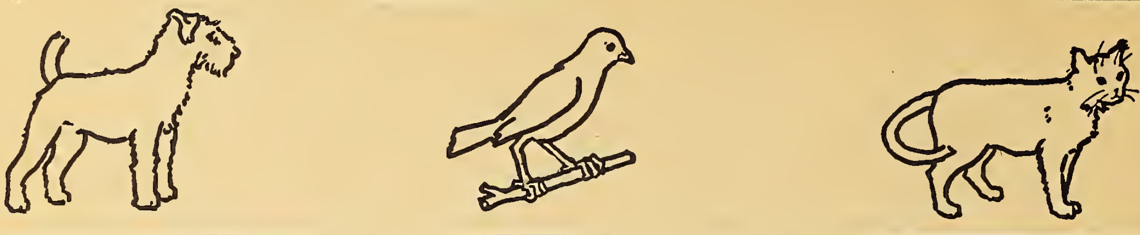

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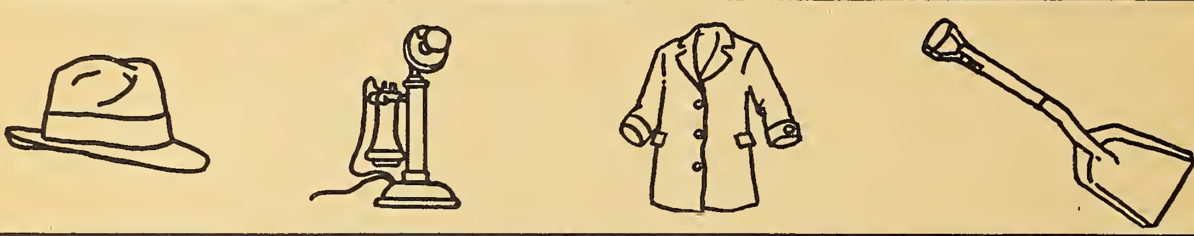

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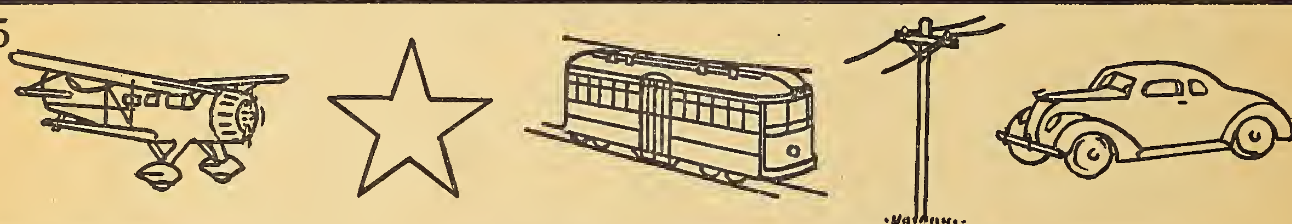

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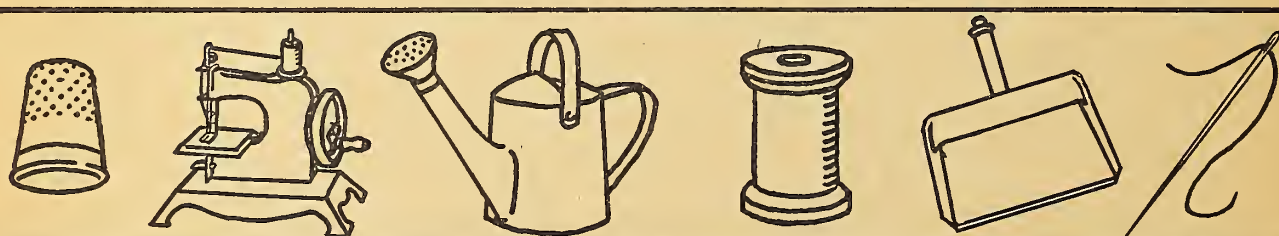

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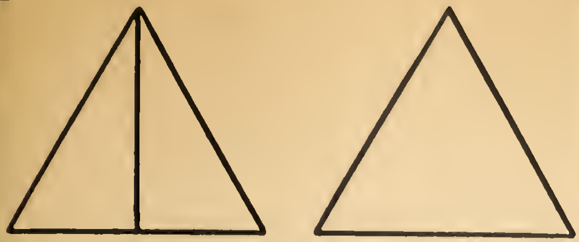

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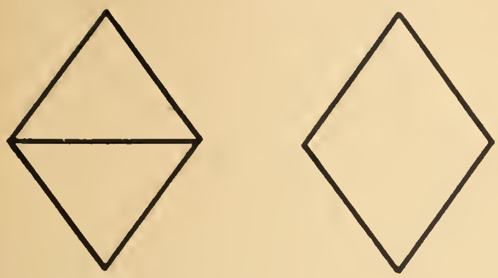

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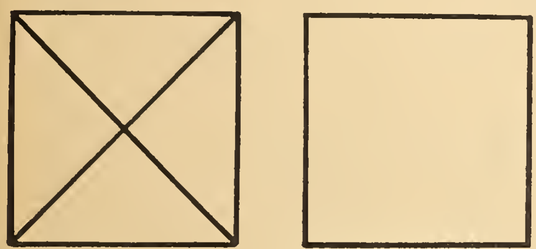

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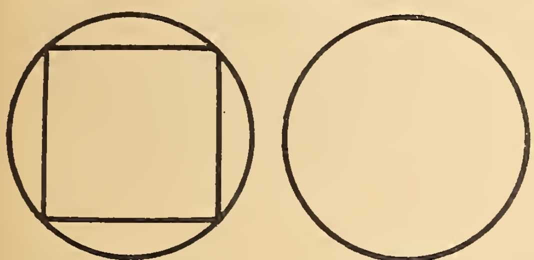

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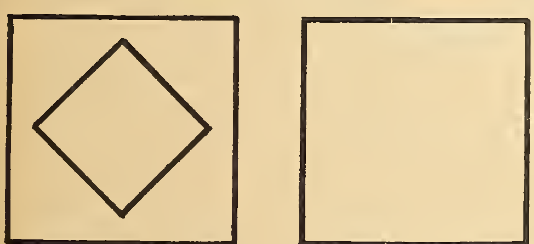

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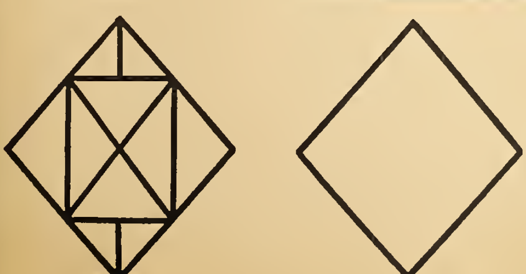

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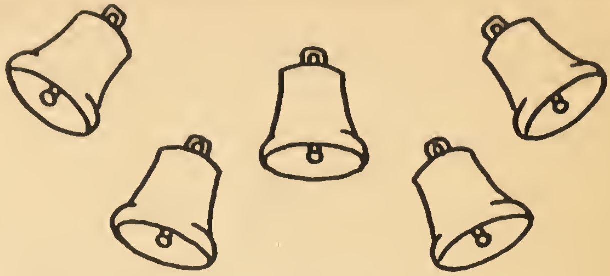

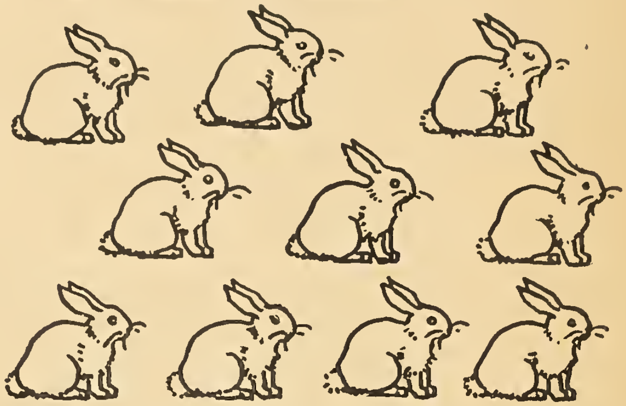

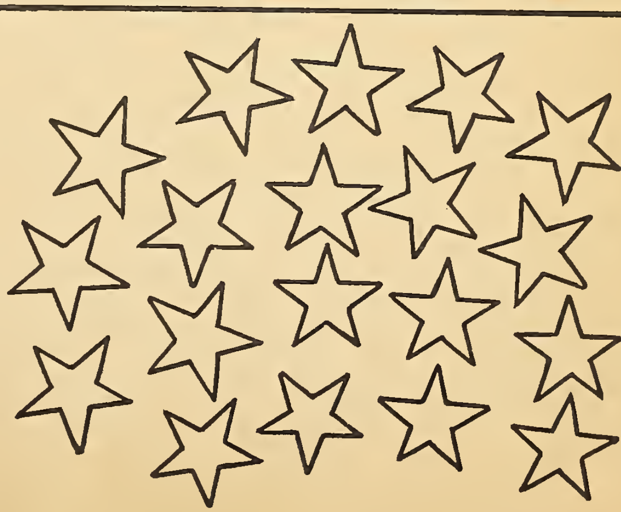

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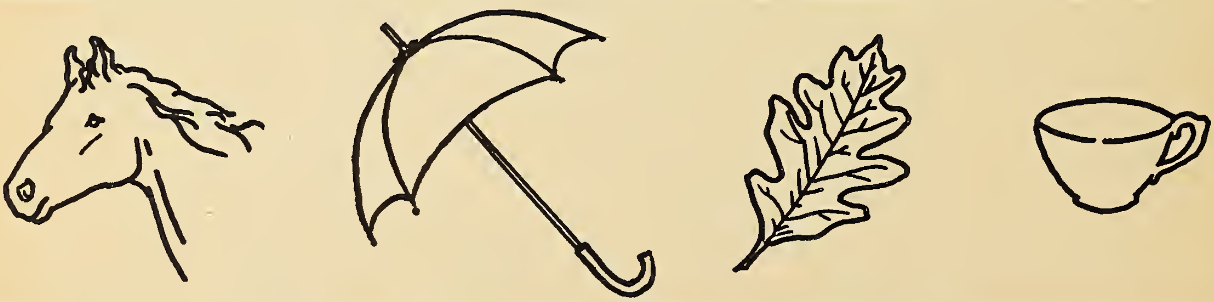

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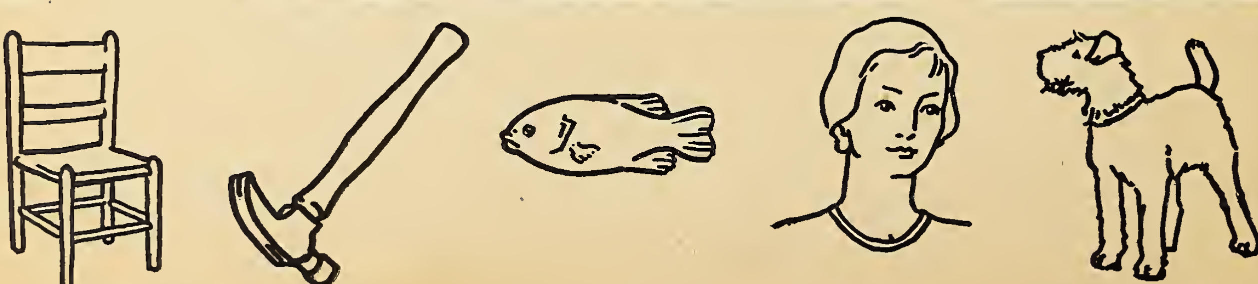

Score ......

DETROIT ADVANCED FIRST-GRADE INTELLIGENCE TEST

By Harry J. Baker

Clinical Psychologist, Detroit Public Schools, Detroit, Michigan

TEST: FORM A

Name..Boy or Girl........Grade........Class........
(First name, initial and last name)

Date of Testing......................Date of Birth......................Pupil's Age: Yrs......Mos......
Month Day Year Month Day Year

Teacher.................................Examiner.................................

School...

City..........................County..........................State..........................

Test	Score
1	
2	
3	
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5	
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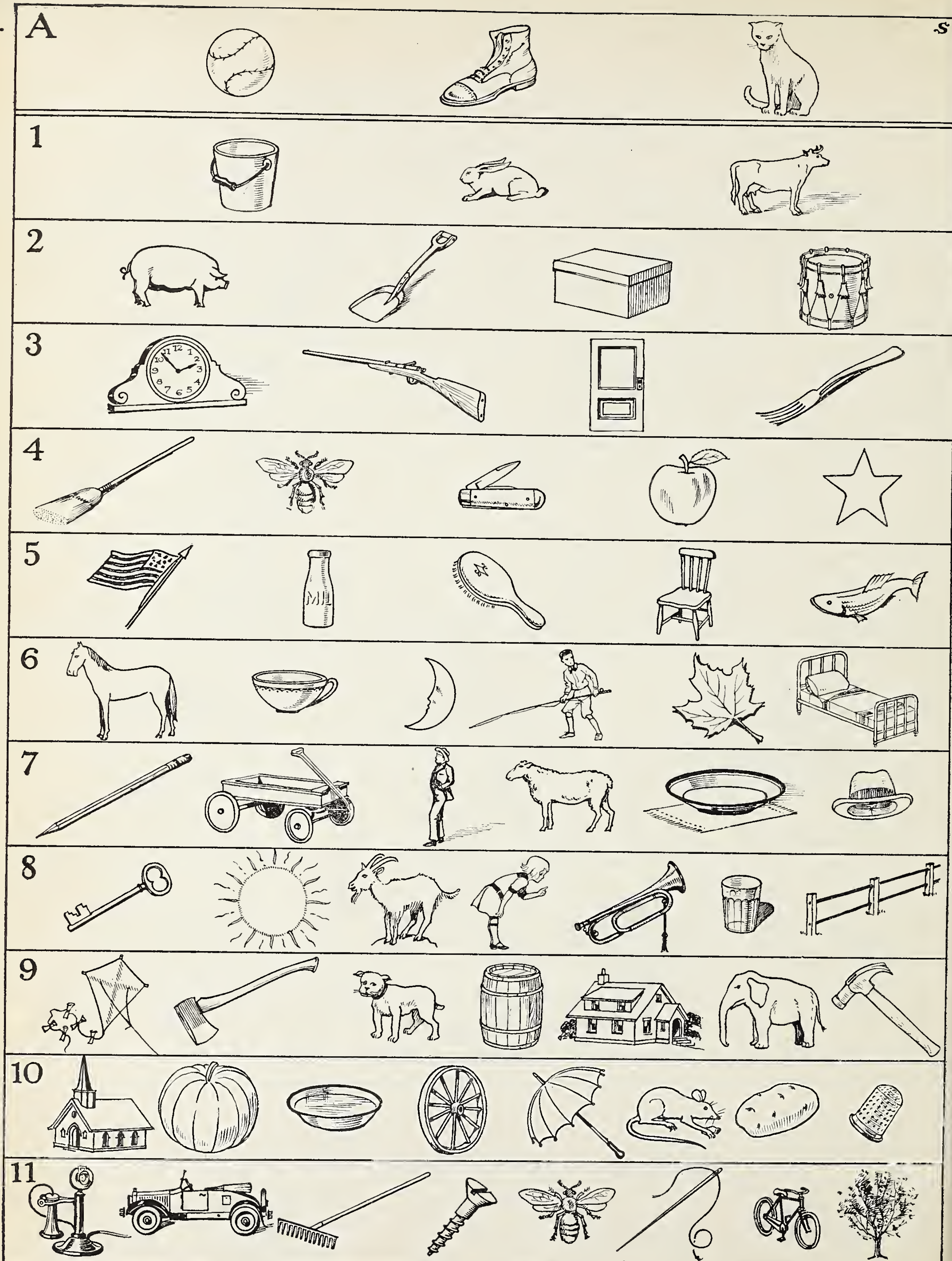
7	
Total	

a

1



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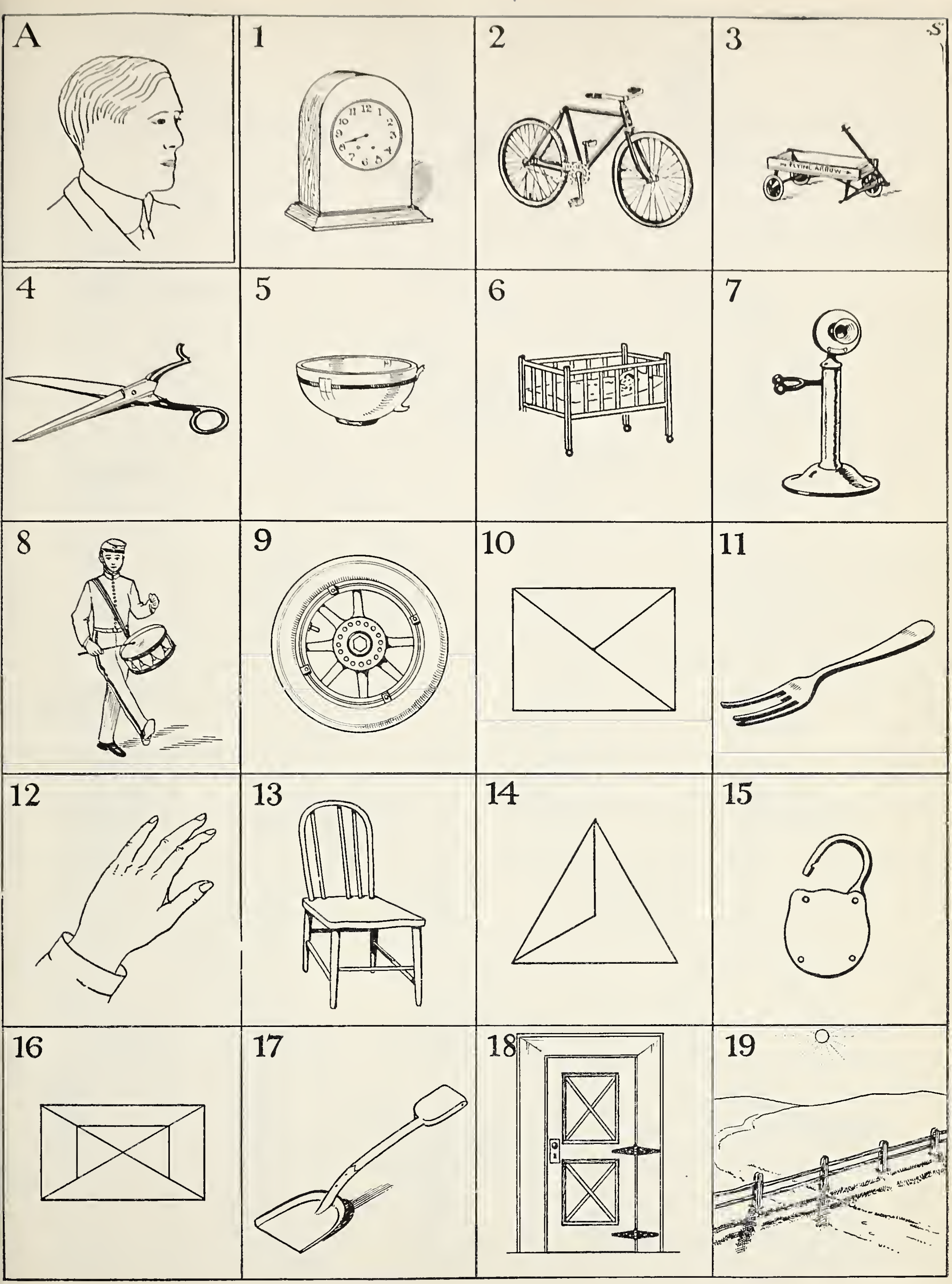

Number right ______ *(Score)*

3

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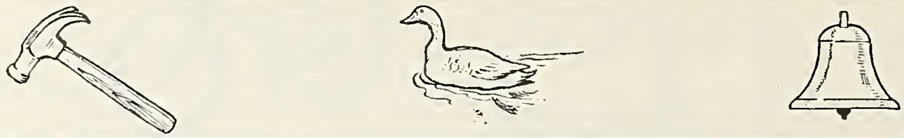

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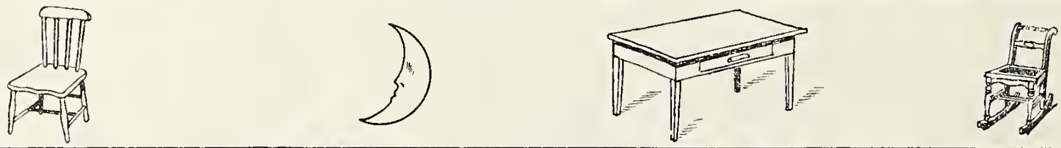

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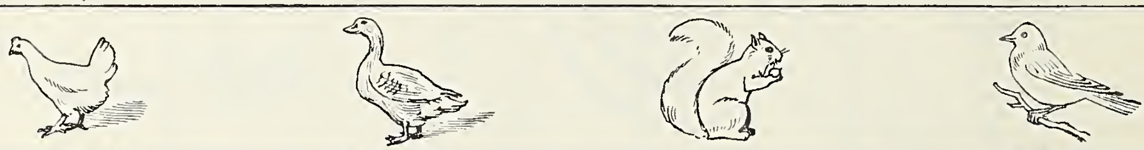

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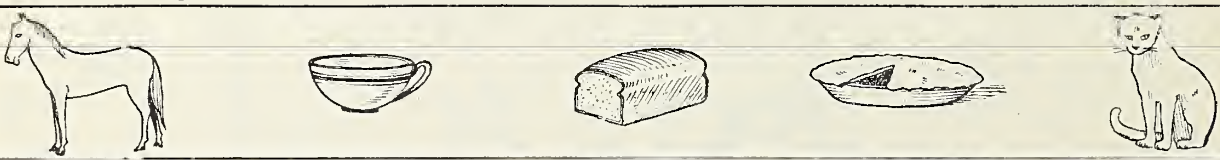

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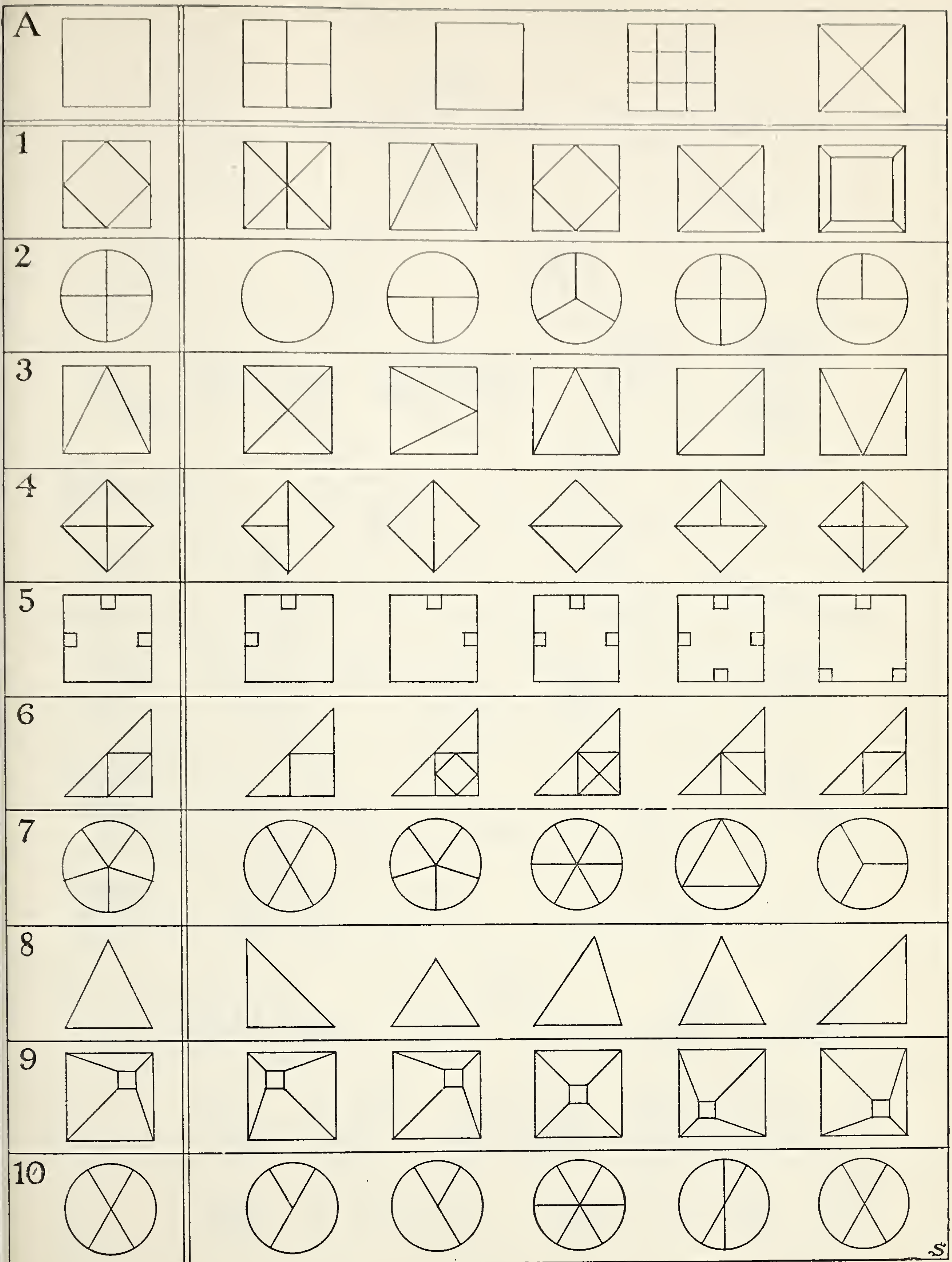

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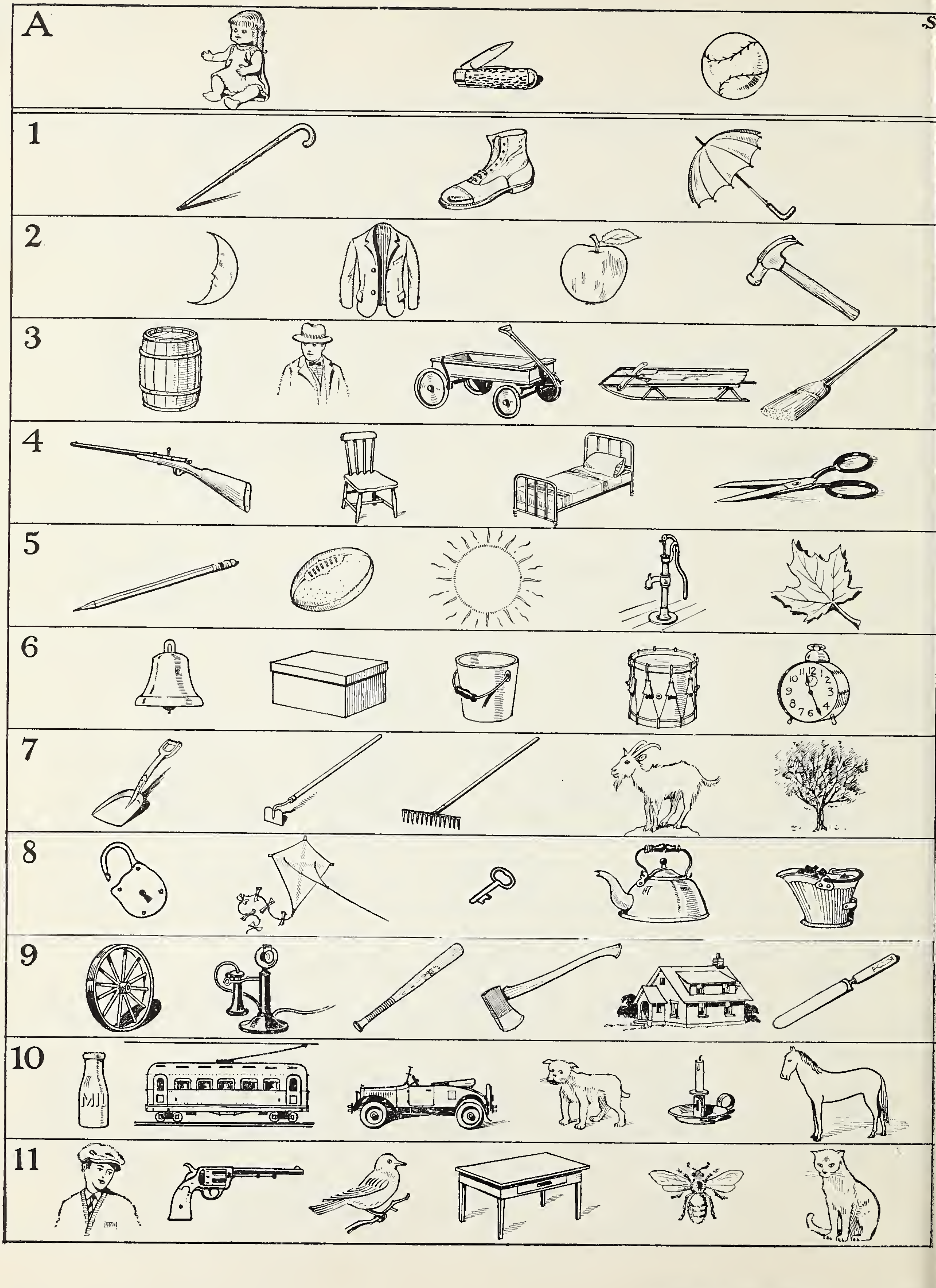

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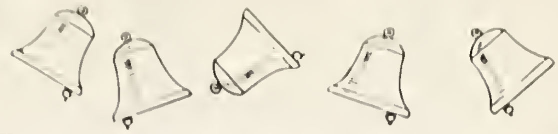

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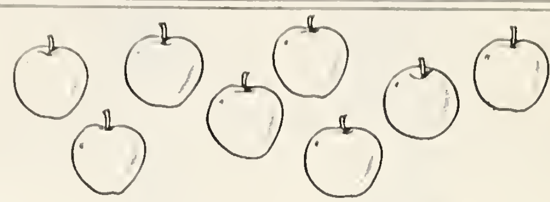

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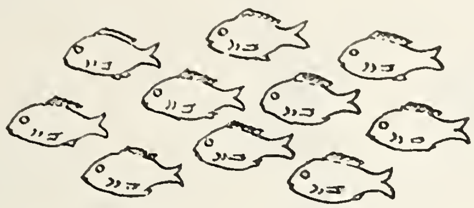

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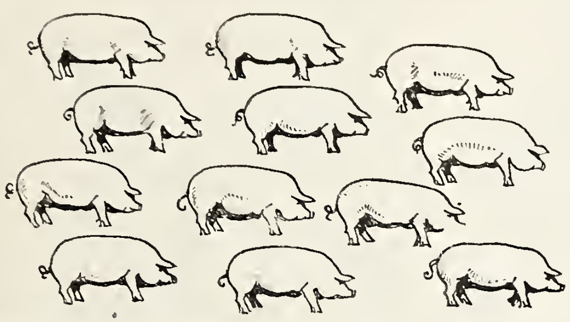

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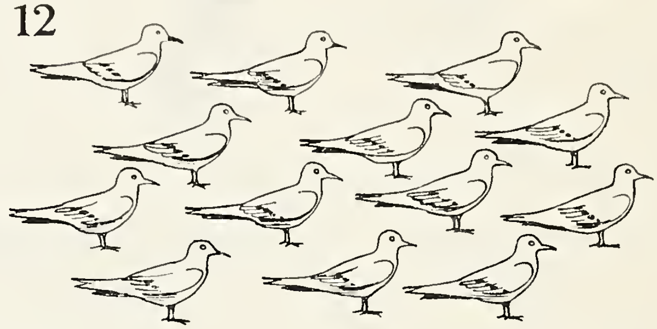

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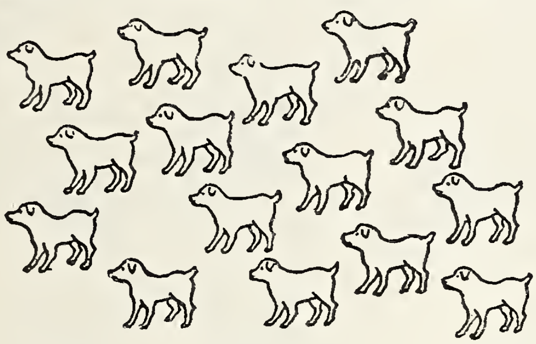

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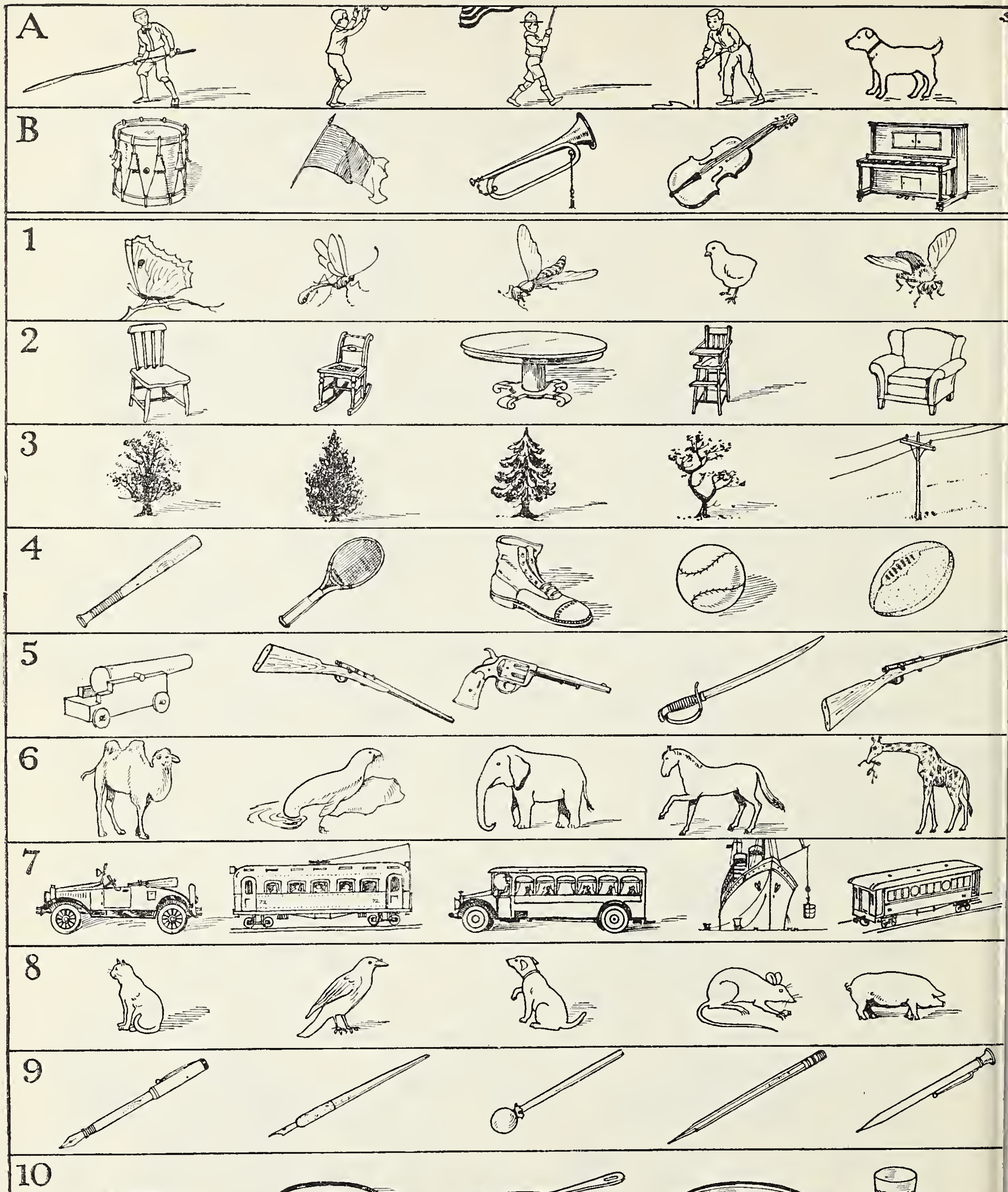


Number of rows right ______ *(Sc*

AUDITORY TESTS FOR READING READINESS

NAME ______________________________

AGE __________ YEARS __________ MONTHS

SCORE ON DETROIT ______ YEARS ______ MONTHS I.Q. __________

AUDITORY MEMORY SPAN ________________

AUDITORY FUSION ________________

AUDITORY DISCRIMINATION ________________

AUDITORY STORY MEMORY ________________

AUDITORY LETTER SPAN ________________

Total of auditory tests ________________

READING ACHIEVEMENT

GATES ______________________________

Auditory Tests to be Administered to Determine Reading Readiness

Auditory Memory Span Test [illegible]

Directions. "I am going to tell you something. After I have finished, you say it."
(Do not prompt or repeat. Continue until one or more mistakes is made in each of 5 sentences.)

Example: I have a puppy.
Our puppy ran away.

1. My kitten likes milk.
2. Mother will be here soon.
3. Jack Frost comes when I am fast asleep.
4. I rode the pony far into the woods.
5. The hen opened the bag and ran away.
6. My brother did not know which way to go.
7. When my rabbit gets loose, he is hard to catch.
8. A rabbit chased the puppy all the way home.
9. We like to wade in the water when it is not too cold.
10. The small white chick had no mother.
11. When the kite was high in the sky, the string broke.
12. The little pine had long green needles.
13. The sun was shining but the rain kept falling.
14. The big brown bear ate honey three times that day.
15. The sly fox had a large bushy tail.
16. We had dogs, kittens and rabbits in our circus.
17. The little children saw the pretty rainbow in the sky.
18. In winter, we slide down the hill on our sleds.
19. The big eyes of the owl were bright and shining.
20. The postman brings us letters or packages almost every day.
21. A goat ate all the fresh green leaves on the tree.
22. He was a tall lean man with a long grey beard.
23. When winter comes, the animals grow heavy coats of fur to keep them warm.
24. The nice little puppy played with the white furry kitten all day long.
25. The carpenter had a heavy hammer, a sharp saw, and a long ladder.

Score	Rating
21-25	Superior
17-20	Good
13-16	Mediocre
8-12	Poor
1- 7	Failure

Score one mark for each sentence correctly repeated

Score ______________

Auditory [illegible] Test (This [illegible])

Directions: "I will give you [illegible] Listen carefully [illegible] sounds [illegible] tell me [illegible] they make.

Examples:

a. b-[illegible] [illegible]

c. f-[illegible] [illegible]

Test:

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. h-[illegible]
7. [illegible]
8. g-[illegible]
9. [illegible]
10. [illegible]
11. [illegible]
12. [illegible]
13. [illegible]
14. [illegible]
15. [illegible]
16. [illegible]
17. [illegible]
18. [illegible]

This may be a [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] times.

Give one point for every word [illegible] correctly.

Score ____________

Auditory Discrimination Test

Directions:

Place the child with his back to you and say the words in an ordinary conversational tone. Do not emphasize or exaggerate the enunciation of the words. The child responds by saying that the words are "The same" or "Different"

I

1. for - fer
2. pick - tick
3. popping - potting
4. shape - shake
5. sell - sell
6. big - big
7. [illegible] - hunting
8. rub - rug
9. fit - fit
10. free - three
11. walking - waking
12. [illegible] - set
13. roof - rough
14. suit - shoot
15. bedding - begging

II

1. sit - sort
2. like - like
3. gaining - [illegible]
4. owl - now
5. bell - bell
6. [illegible]
7. fleeing - [illegible]
8. time - [illegible]
9. [illegible]
10. den - [illegible]
11. messing - [illegible]
12. part - part
13. pen - pin
14. [illegible]
15. [illegible]

III

1. noon - noon
2. fell - fell
3. fighting - fighting
4. coat - coat
5. men - men
6. red - led
7. tubbing - tugging
8. led - leg
9. bake - beak
10. told - gold
11. teething - teasing
12. pass - path
13. feed - fed
14. goat - boat
15. [illegible] - shelling
16. [illegible] - dreg

IV

1. bid - [illegible]
2. keep - [illegible]
3. [illegible]
4. half - [illegible]
5. [illegible]
6. send - send
7. buffing - [illegible]
8. push - push
9. [illegible]
10. moon - [illegible]
11. looking - [illegible]
12. [illegible]
13. [illegible]
14. [illegible]
15. [illegible]
15. [illegible]

Score: 64 - no of errors

Scale ____________

Primary Form

Reading Aptitude Tests by Marion Monroe

Auditory Story Memory

Say "I am going to read a little story. Listen carefully and when I am through I will ask you to tell me the story."

Read the story with expression. Then say: "Now tell me [illegible] the story was about." Underline the ideas reproduced by the child.

Score The number of ideas which the child reproduces. Each idea credited for scoring is indicated between dashes. The idea does not need to be complete to score. For example the child may be scored with the idea "eating lettuce" if he says either eating or lettuce. He may change words, saying "chased them" instead of "ran towards them" and [illegible] is credited with the idea. Extraneous ideas [illegible] be jotted down on the blank line but do not count them in scoring. If the child says "about three little pigs" [illegible] credited with the idea three, but not with pigs since [illegible] is about chicks.

A mother hen --- had three ---baby chicks.--- Their names

were Scratchy ---Patchy---and Chick-Chick.---One day---

the chickens---went for a walk---in Farmer Joe's garden.---

They were having a fine time --- eating lettuce --- when a

big dog ---ran towards them ---barking loudly.---The chickens

ran home---as fast as they could,---all except Chick-Chick,--

who hid---behind a big leaf--until the dog went away.

Score: Total number of ideas correct.

Score: ______________________

[illegible] Memory Span Test

This is based on the initial and final consonant sounds and vowel sounds learned in the first grade. The sounds should be repeated at one second intervals. Two attempts are allowed at each level. If the first is correct do not give the second. If the second test is not correct give no credit and discontinue the test. The child must repeat the sounds in the order given for the first test and in reverse order for the second test.

Say, Listen carefully. I am going to say some sounds and I want you to say them to me after I have said them.

For Backward say: Listen carefully I am going to say some sounds and I want you to say them to me after I have said them but say them backward.

Example

Forward I say t, s. You say t, s.

Backward I say t, s. You say s, t.

(Note: Give this direction just before giving the test for the backward sounds)

Test 1
Forward:

Test 2
Backward

Test 1 Forward		Test 2 Backward	
[illegible] hard [illegible]	2	b, [illegible]	[illegible]
[illegible] hard [illegible]	2	[illegible]	[illegible]
[illegible]	3	d, hard [illegible]	[illegible]
[illegible]	3	m, hard [illegible]	[illegible]
[illegible] short [illegible]	4	[illegible] long [illegible]	[illegible]
[illegible] short [illegible]	4	[illegible] long [illegible]	[illegible]
[illegible]	5	[illegible]	[illegible]
th, [illegible]	5	sh, [illegible]	[illegible]
[illegible] long [illegible]	6	short [illegible]	[illegible]
[illegible] long [illegible]	6	[illegible]	[illegible]

Score: Circle the amount carried on each test [illegible]

Score: ____________

MURPHY-DURRELL
DIAGNOSTIC READING READINESS TEST

For Group Use

By Helen A. Murphy
Associate Professor of Education
Boston University School of Education

and Donald D. Durrell
Dean, School of Education
Boston University

Test	Score	Percentile
1. Auditory		
2. Visual		
3. Learning Rate		
Total		

Name . . . . Boy . . . . . Girl . . . . .

Teacher . . . . Grade . . . . . School . . . .

City . . . . County . . . . State . . . .

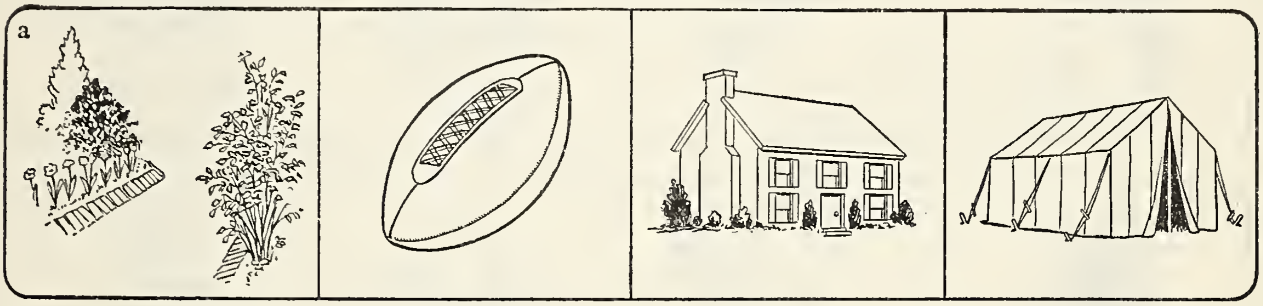
Date of Testing . . . .
Year Month Day

Date of Birth . . . .
Year Month Day

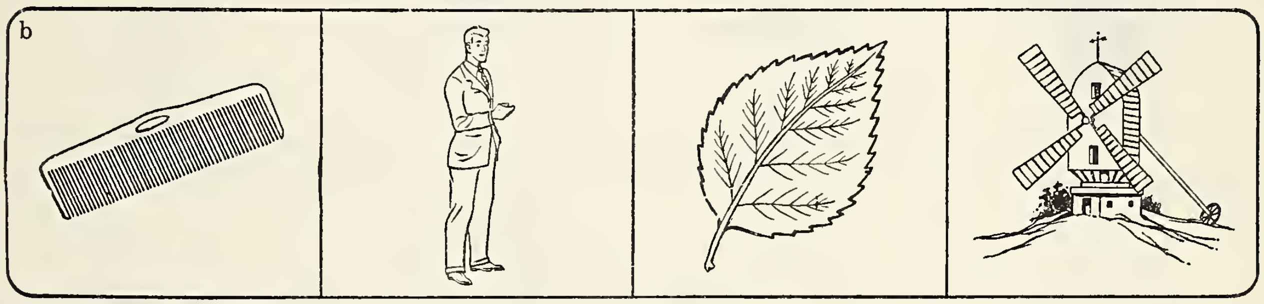
Pupil's Age Yrs . . . . . . Mos. . . . . .

PRACTICE EXERCISES

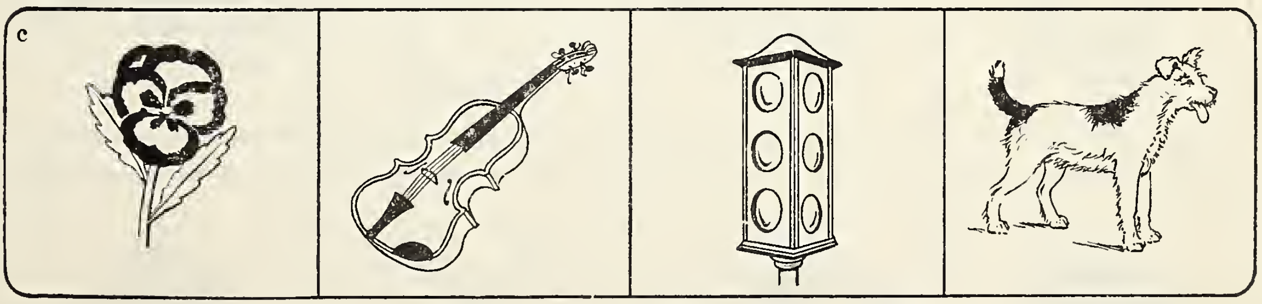
a



b



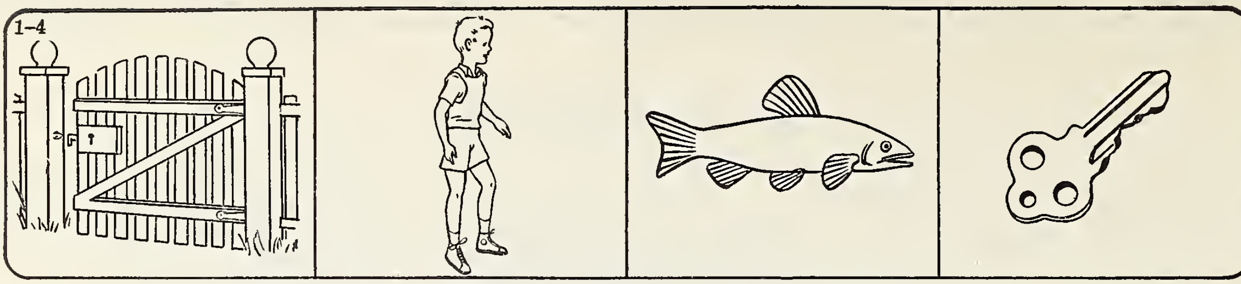
c



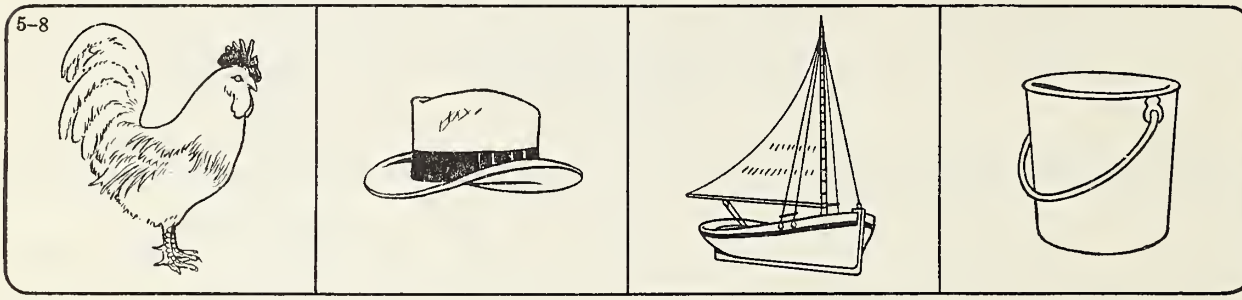
Published by World Book Company, Yonkers-on-Hudson, New York, and Chicago, Illinois

TEST 1. AUDITORY

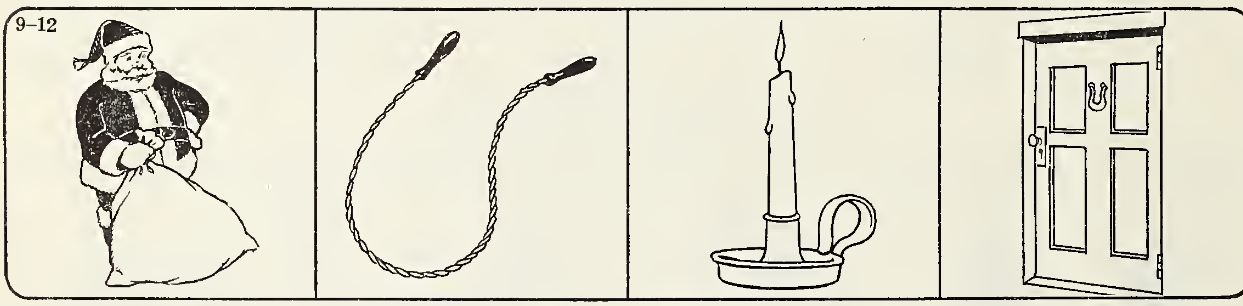
1–4



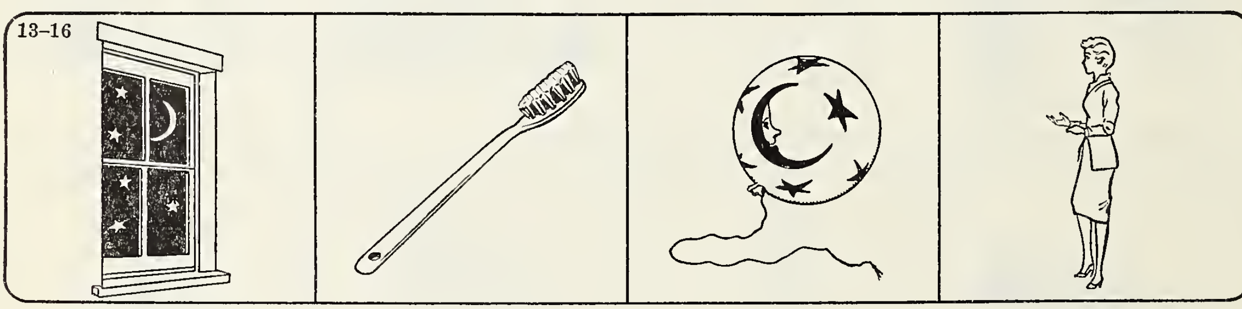
5–8



9–12



13–16



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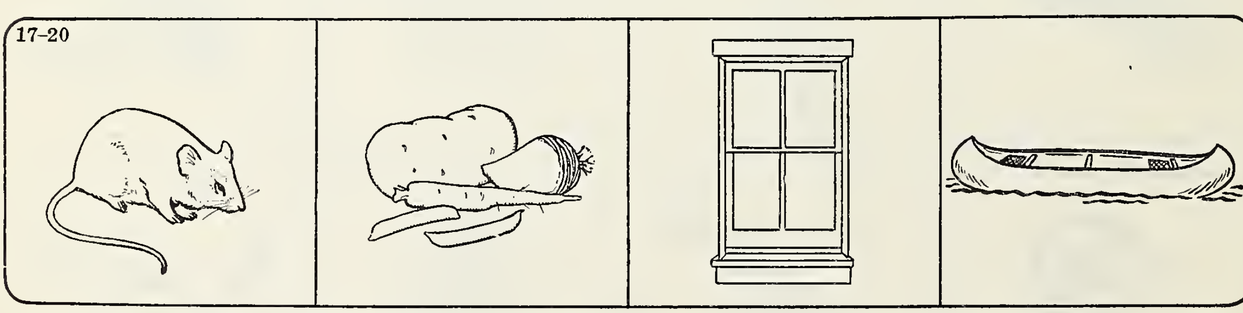

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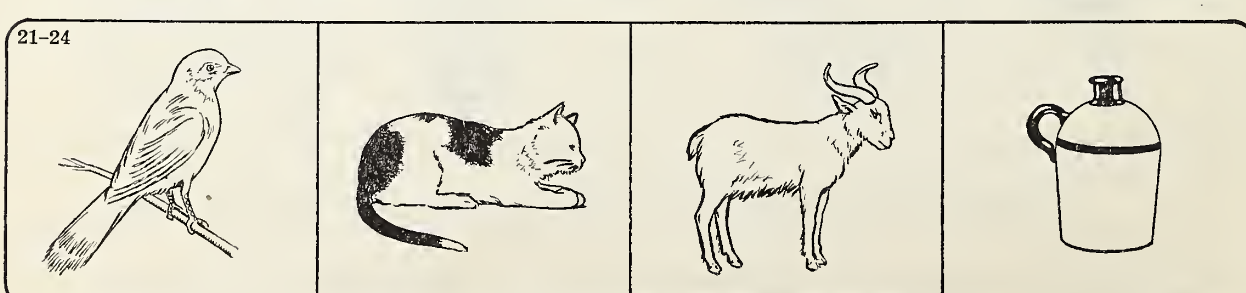
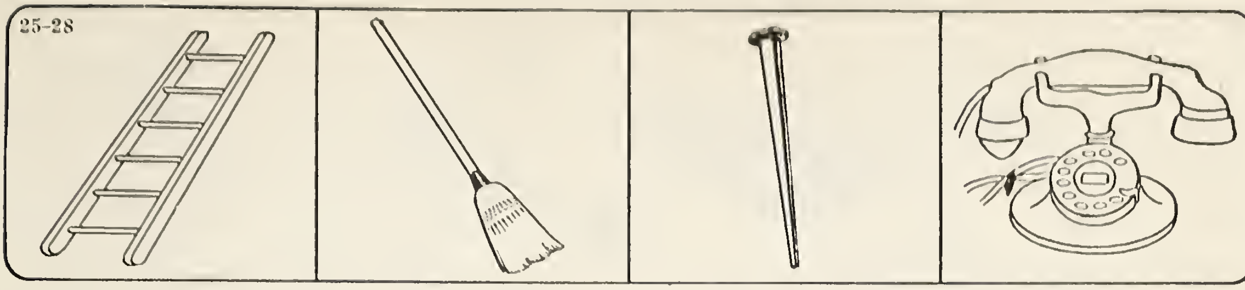


TEST 1. AUDITORY (*Continued*)

25–28



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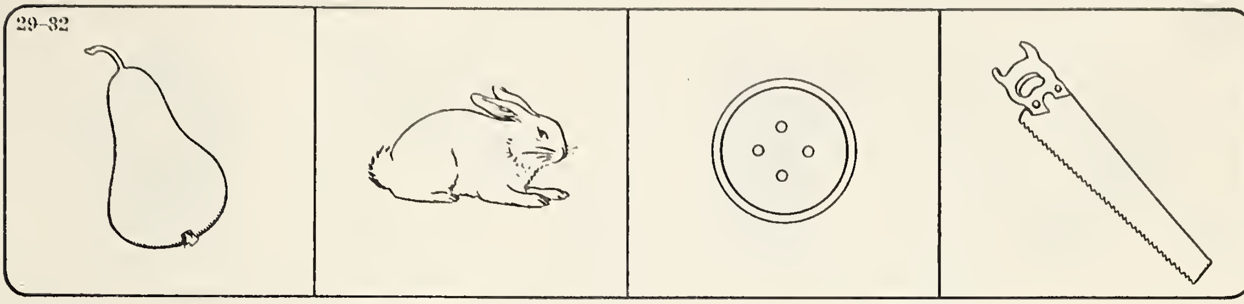

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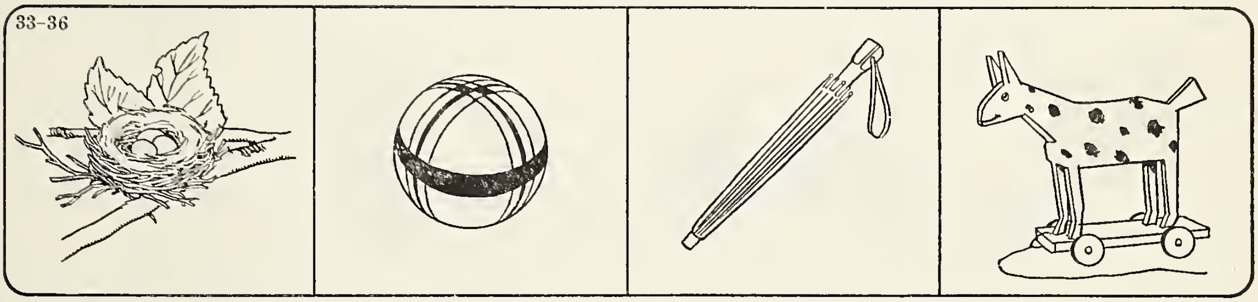
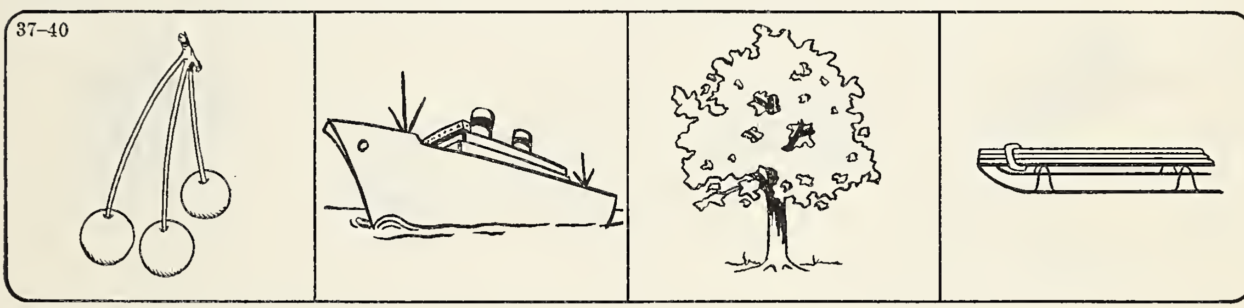


37–40



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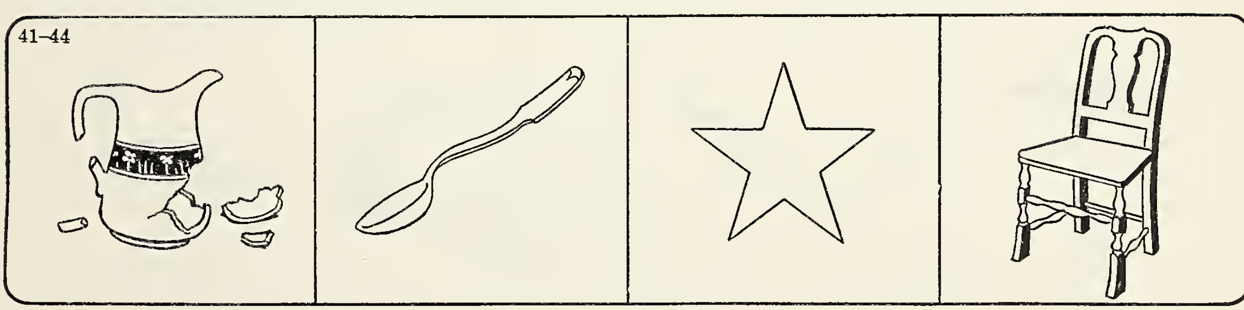
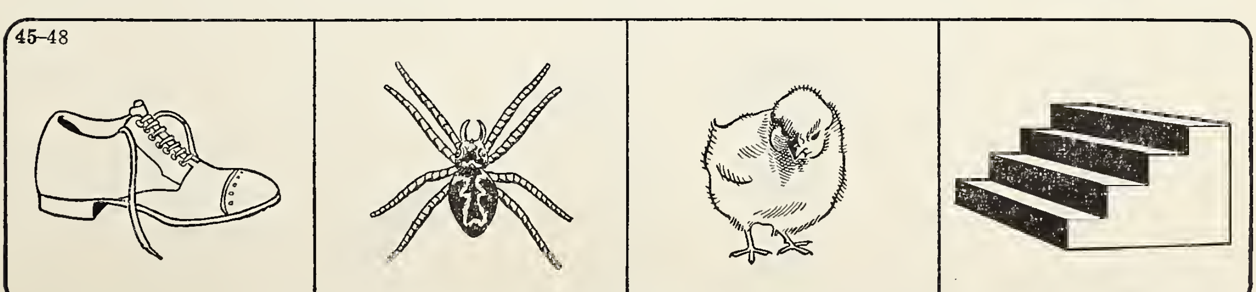
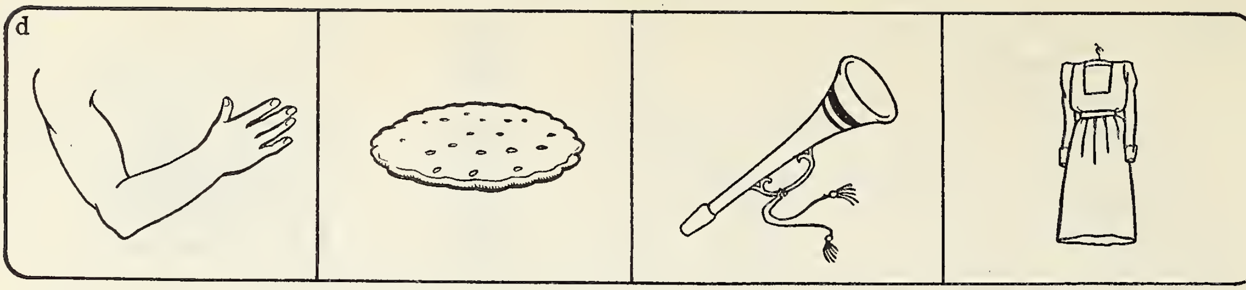


45–48

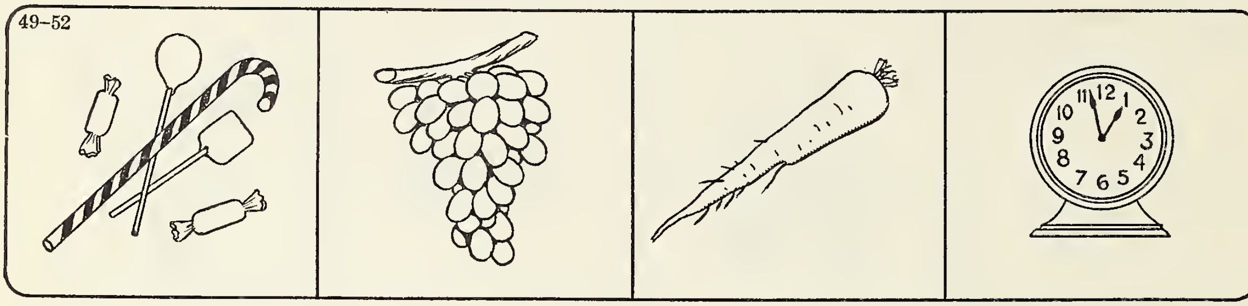


TEST 1. AUDITORY (*Continued*)

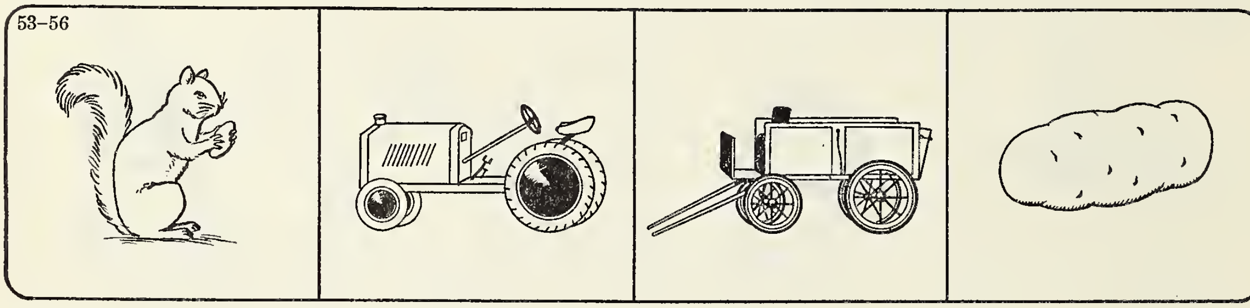
d



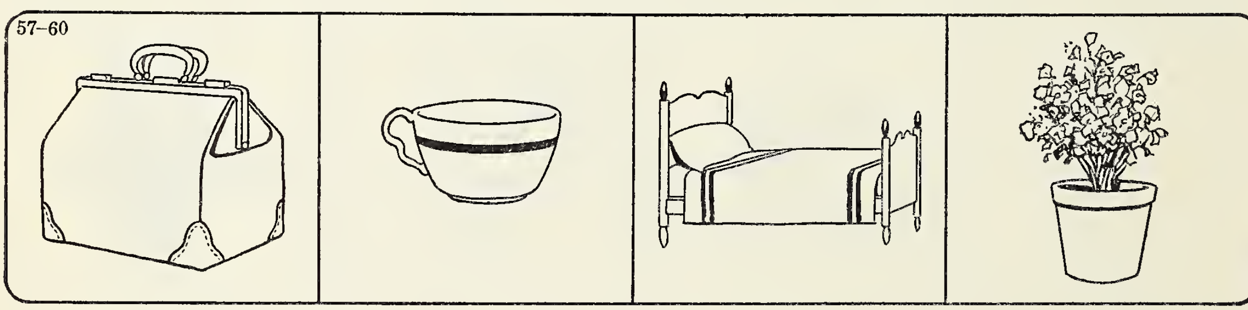
49–52



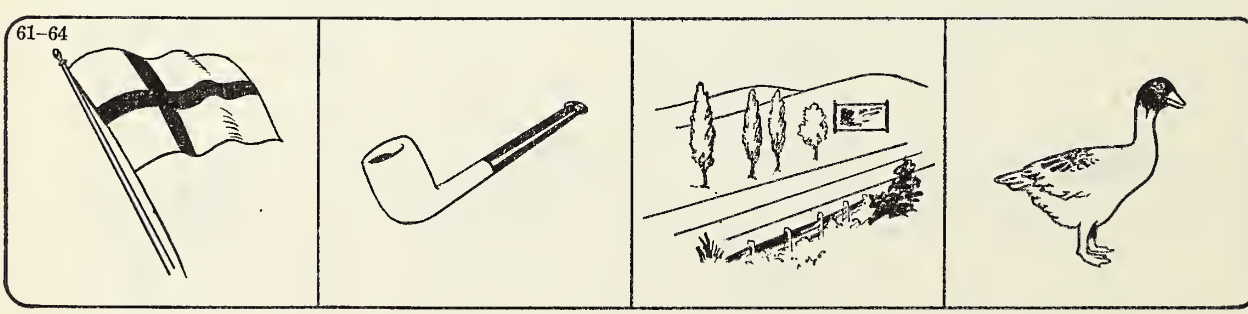
53–56



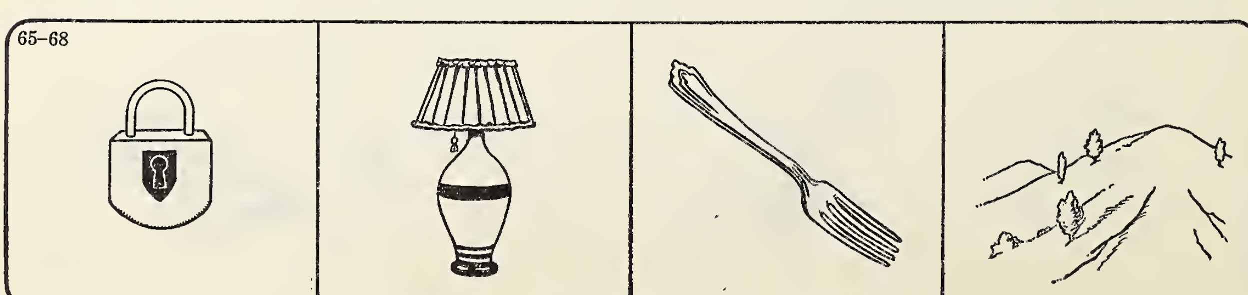
57–60



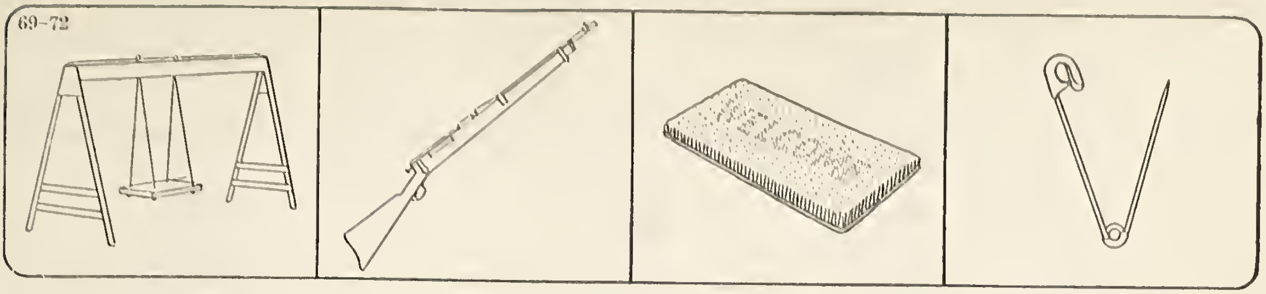
61–64

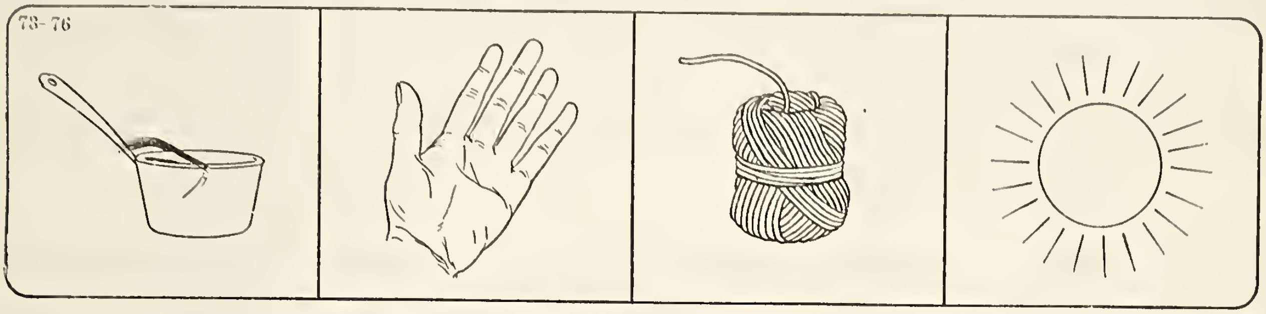


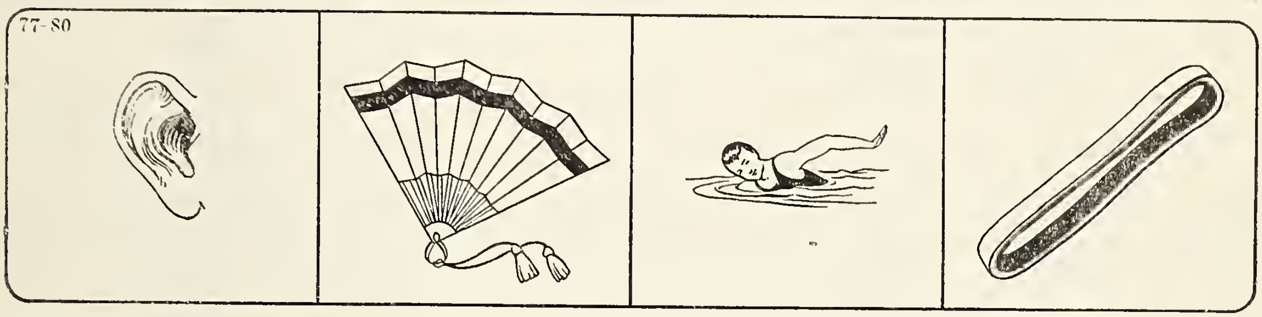
65–68

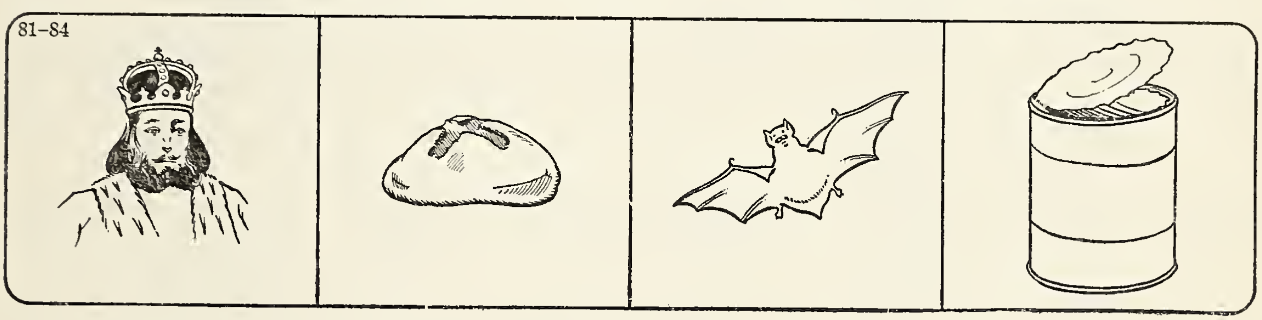


TEST 1. AUDITORY (*Continued*)









Score........

TEST 2. VISUAL

1	m b o s y	14	w u v y n
2	e a r m f	15	c o a e d
3	v m h u c	16	w u n m v
4	g i k t y	17	m b n d u
5	v w u m n	18	g y j i q
6	c e o a r	19	e i j l t
7	e o c g a	20	f t h k l
8	t l h b k	21	o a e c g
9	s c z m f	22	r o n m u
10	h k l t f	23	p d b q g
11	h k t f l	24	g b p q d
12	g p y q h	25	p g b d q
13	s x o m z	26	d p g q b

TEST 2. VISUAL (*Continued*)

27
at ball
ill all fall

28
no in
nip on imp

29
play day
boy dog boys

30
me men
name man run

31
saw war
as was waste

32
tis sit
sat it site

33
dark lack
clock black block

34
barn bun
burn bar done

35
frost first
fast firm trust

36
nose ice
mice race nice

37
speak speck
stick spice peck

38
drip prop
drops rap drop

39
jump jest
just jot must

40
alone abuse
absent abide along

41
clasp class
clear clean cleat

42
would word
world whirl wound

43
fondle foolish
forage forget forbid

44
terrace terrier
terrific tremble testify

TEST 2. VISUAL (*Continued*)

45

par park

party part dark

49

form reform

uniform inform deform

46

quiver quiz

quote quoit quire

50

curtain certain

sustain retain maintain

47

dinner differ

diffuse digress diction

51

shrub shrink

shovel shriek shorten

48

sure scare

secure server cure

52

convent convict

contain contact conduct

Score . . . .

TEST 3. LEARNING RATE

	FIRST TEST	SECOND TEST	THIRD TEST
toothbrush			
bracelet			
celery			
against			
iron			
machinery			
handkerchief			
naughty			
scissors			
chocolates			
Number right			

Score (Number right on third test) . . . .

Local Board of Health
School Health Services
Edmonton, Alberta

The Massachusetts Hearing Test

Name ______________________ Grade __________ School __________

Room __________ Date __________

Example:

1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

I
Right Ear

A. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

B. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

C. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

Total

II
Left Ear

A. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

B. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

C. 1 yes no
2 yes no
3 yes no
4 yes no
5 yes no
6 yes no

Total

NEALE
ANALYSIS OF READING ABILITY

By M. D. NEALE, M.A., Ph.D.

INDIVIDUAL RECORD SHEET — FORM A

Name School

Sex Age Date of Birth I.Q.

Family M F Examiner Date

INITIAL INTERVIEW

Appearance

Hearing Eyesight

Interests

Pertinent Emotional Difficulties

Attitude to Reading. Likes "a little" "a lot" "not really"

Attitude to School. Likes "a little" "a lot" "not really"

QUALITATIVE ASSESSMENT

PERSONAL CHARACTERISTICS

Needs encouragement to begin reading

Refuses to try unknown words

Repeats words or phrases habitually

Reads in a quiet loud

mumbled hurried voice

WORD RECOGNITION

Guesses at unknown words

Reverses words

Uses contextual clues

Spells out words

Sounds out letter combinations but cannot synthesize

Does not know letters

Does not know sounds

GENERAL READING HABITS

Reads word by word

Ignores punctuation

Enunciation. Poor Average Good

Holds reading close to face

Uses finger as pointer

Loses place frequently

Head movements. Marked Slight

TEST SUMMARY

Passage	Words read	Time in secs.	Errors	Accuracy score	Comprehension
1	26		=		
2	75		=		
3	149		=		
4	240		=		
5	358		=		
6	497		=		
Totals		*			

Reading Ages

$$* \text{ Words per min.} = \frac{\text{Words}}{\text{Time}} \times \frac{60}{1} = - \times \frac{60}{1}$$

Choice of Story

Comments or Recommendations

1 KITTEN (26)	Mis*	Sub	Ref	Add	Oms	Rev
A						
black						
cat						
came						
to						
my						
house.						
She						
put						
her						
kitten						
by						
the						
door.						
Then						

1 continued	Mis	Sub	Ref	Add	Oms	Rev
she						
went						
away.						
Now						
I						
have						
her						
baby						
for						
a						
pet						

Errors ....
Time ....
Comprehension ....

Questions
1. What came to the little boy's/girl's house?
2. Where did the black cat leave her kitten?
3. What did the black cat do then?
4. What did the little boy/girl do with the kitten?

2 TOM (49)	Mis	Sub	Ref	Add	Oms	Rev
Tom						
stopped						
on						
his way						
to school.						
The milkman's						
horse had						
wandered						
in the fog.						
The horse						
and cart						
blocked						
the centre						
of the road.						
Traffic						
was coming.						
There was						

2 continued	Mis	Sub	Ref	Add	Oms	Rev
no						
time						
to call						
the milkman.						
Quickly						
Tom						
led						
the horse						
to safety						
just as the						
frightened						
milkman						
returned.						

Errors ....
Time ....
Comprehension ....

Questions
1. Where was Tom going?
2. What did he see on the way?
3. What had happened to the horse?
4. What kind of day was it?
   Or What was the weather like?
5. Why was it dangerous for the horse and cart to stay there?
6. Why didn't Tom call the milkman?
7. What did Tom do?
8. How did the milkman feel as he came running back?

3 CIRCUS (74)	Mis	Sub	Ref	Add	Oms	Rev
The lions'						
final						
act was						
in progress.						
Jack stood						
waiting to						
clear the ring.						
Tonight the						
thunder						
outside the						
circus tent						
had made the						
lions restless.						
Suddenly Tess,						
the lion trainer,						
stumbled.						
Her whip fell.						
The youngest						
lion sprang						
towards her.						
Swiftly						

3 continued	Mis	Sub	Ref	Add	Oms	Rev
Jack leaped						
inside the cage,						
cracking the						
whip with						
great skill.						
His prompt						
action						
enabled						
Tess to regain						
control quickly.						
During						
that brief						
adventure,						
however, Jack						
had decided						
upon his						
future work.						

Errors ....
Time ....
Comprehension ....

Questions
1. Where did this story take place?
   Or Where was all this happening?
2. Were the lions near the beginning, near the middle or near the end of their act?
3. What was Jack waiting to do?
4. Why were the lions restless?
5. What happened to Tess?
6. What did Jack do?
7. Who finished the act?
8. What did Jack decide after this adventure?

* *Mispronunciations, Substitutions, Refusals, Additions, Omissions, Reversals*

4 DRAGON (91)	Mis	Sub	Ref	Add	Oms	Rev
The fearful						
roaring of the						
dragon guided						
the Knight to						
the monster's						
territory. As the						
intruder crossed						
the dreaded						
marshes, the						
dragon charged						
furiously,						
whipping its						
enormous tail						
around the legs						
of the Knight's						
steed. Horse and						
rider collapsed.						
The Knight now						
realised that he						
must attack when						
the creature						
was off-guard.						

4 continued	Mis	Sub	Ref	Add	Oms	Rev
He crouched						
as though						
wounded.						
The monster,						
accustomed to						
speedy victory,						
prepared to seize						
its prey. Then						
the Knight struck						
powerfully						
beneath the						
beast's out-						
stretched wing.						
A despairing						
groan told the						
villagers that						
they would be						
troubled no more.						

Errors ....

Time ....

Comprehension ....

Questions

1. How did the Knight know exactly where to find the dragon?
   Or What guided the Knight to the dragon?
2. What kind of land did the Knight have to cross over?
3. How did the dragon knock the Knight down?
4. What did the Knight realise would be a good moment to attack the dragon?
5. What did the Knight pretend?
6. Why did the dragon think that its very first blow could kill the Knight?
7. What part of the dragon's body did the Knight strike?
8. Why would the villagers be pleased at the defeat of the dragon?

5 SUBMARINE (118)	Mis	Sub	Ref	Add	Oms	Rev
The stricken						
submarine						
lay at a depth						
of approximately						
one hundred and						
twenty feet.						
Although it was						
common						
knowledge that						
the treacherous						
currents of the						
area would						
make rescue						
operations						
difficult, the						
crew remained						
disciplined and						
confident. Mean-						
while, outside						
their prison,						
a diver with						
technical						
equipment for						
their release						
was in peril.						
His life-line						
had become						
entangled						
around a						
projection on						
an adjacent						

5 continued	Mis	Sub	Ref	Add	Oms	Rev
wreckage.						
Experience						
warned him						
against his						
first impulse						
to dislodge the						
line by force.						
Patiently						
he turned						
and twisted.						
At last his						
calmness and						
persistence						
were rewarded.						
Triumphantly he						
detached the						
final loop from						
the obstruction.						
Then fatigued						
but undaunted by						
this unpleasant						
accident,						
he proceeded						
to provide an						
escape exit for						
the submarine's						
captives.						

Errors ....

Time ....

Comprehension ....

Questions

1. What did the diver have to do in this story?
2. To what depth did he have to go?
3. What made rescue work difficult in this area?
   Or What was this part of the sea noted for?
4. How did the crew feel? Add Were they hopeful or had they given up hope?
5. What happened to the diver?
6. What did the diver's experience warn him not to do?
7. How did the diver behave in his danger?
   Or What qualities did the diver show in his danger?
8. What did the diver do as soon as he was free?

6 EVEREST (139)	Mis	Sub	Ref	Add	Oms	Rev
Realising the						
necessity for						
conserving						
the strength of						
the team, the						
leader decided						
to pitch an						
intermediate						
camp. The						
initial						
enthusiasm and						
anticipation						
of attaining						
the final camp						
had been						
subdued						
by the recent						
mishap						
in which one						
member had						
fallen into a						
crevasse.						
Although the						
rescue had been						
accomplished						
magnificently,						
it was obvious						
that the						
incident						
had hampered						
the original						
programme. The						
men accepted						
the leader's						
decision						
with relief.						
The tedious						

6. continued	Mis	Sub	Ref	Add	Oms	Rev
crawl to the						
plateau against						
incessant winds						
of varying						
violence had						
challenged						
their endurance						
to the limit.						
Every step at						
this height						
required						
will-power.						
Immediately						
ahead lay an						
unforeseen rise						
from which,						
by great						
misfortune, all						
the tracks of the						
advance party						
had disappeared.						
Rest was						
essential if						
the men were to						
withstand the						
arduous						
conditions in						
the concluding						
stages of the						
assault						
upon this						
unconquered						
peak.						

Errors ....

Time ....

Comprehension ....

Questions

1. What did the leader realise his men needed?
2. What did the leader decide to do?
3. How did the men feel about the leader's decision to stop climbing? Were they pleased or annoyed?
4. What incident had hindered their progress?
5. What had made them slacken their pace of climbing to a crawl? *Or* What made them go so very slowly?
6. What lay just ahead of them?
7. What piece of bad luck had the team noticed?
8. Why would it be very exciting to reach the peak?

SUPPLEMENTARY DIAGNOSTIC TEST 1. What are the names and sounds of these letters ?

a c o e u i m r n s z v x w
d f h l t b k p y p g j

SUPPLEMENTARY DIAGNOSTIC TEST 2. Auditory discrimination through simple spelling.

tap	man	rat
but	red	pet
big	show	star
gate	chicken	sport

SUPPLEMENTARY DIAGNOSTIC TEST 3. Blending and recognition of syllables.

1. c- old	d- ear	l- ock	t- ask
2. m- ouse	l- augh	s- ight	b- urnt
3. ch- ill	br- ake	th- ief	gr- owl
4. pic- nic	thr- oat	fly- ing	str- ong

LONDON
MACMILLAN & CO LTD
NEW YORK - ST MARTIN'S PRESS

Printed in Great Britain

R.20M.8.60

GATES PRIMARY READING TEST

TYPE PWR
FORM 3

For Grade 1 and Grade 2 (First Half)

Type PWR. Word Recognition

BUREAU OF PUBLICATIONS • TEACHERS COLLEGE • COLUMBIA UNIVERSITY
525 West 120th Street, New York 27, N. Y.

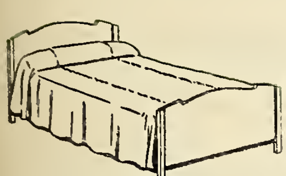
Write your name here..

How old are you?.................................When is your birthday?.................................

School..Grade......................Date..............................

1.


did	egg
dog	two

2.


be	bed
bag	she

3.


may	make
come	milk

4.


horse	play
hose	house

To the teacher: Detailed instructions for administering and scoring this test are given in the Manual (included in each test package).

Number correct.............................. Number wrong.............................. Raw score (correct minus ⅓ wrong)..............................

Number tried..............................(possible 48) Reading grade.............................. Reading age..............................

Be sure to signal STOP at the end of 15 minutes.

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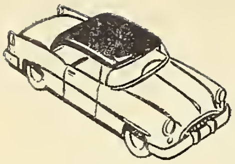
1.



leg	men
car	fly

2.

hid	six
pig	hat

3.

new	men
sled	ten

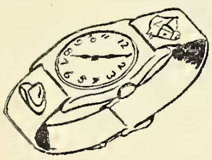
4.

boat	good
bowl	corn

5.

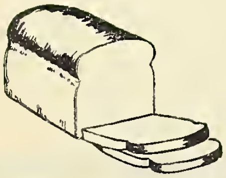
shoe	house
hour	mouse

6.



watch	water
night	house

7.



drink	green
broom	bread

8.

goes	drink
dress	blue

9.

clock	would
wolf	work

10.

boat	gone
goat	road

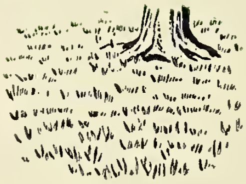
11.

fish	duck
town	dish

12.

cent	sing
six	sled

13.



mouse	great
pussy	grass

14.

paper	sugar
paint	right

15.

mouse	monkey
window	money

16.

splashing	stocking
standing	something

17.

ran cry

hop cap

18.

soon spring

spoon moon

19.

pussy pony

money puppy

20.

star moon

rope read

21.

once nest

does nose

22.

stick stop

store shoe

23.

games garden

kitten gates

24.

bed pet

set not

25.

clothes clouds

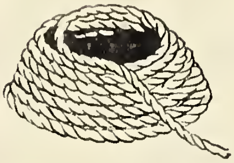
others clover

26.

child think

dolls chick

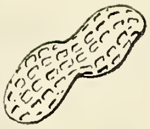
27.



rock ride

rose rope

28.



peanut piano

pupil pencil

29.

round room

road found

30.

riding reading

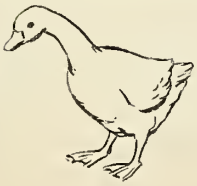
hiding raining

31.

minute kitten

mitten miller

32.

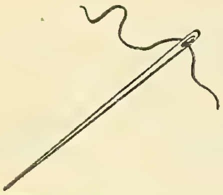


goose goes

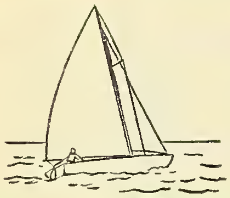
goody loose

33. 

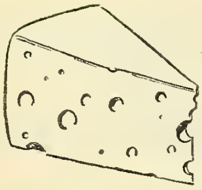
pumpkin napkin
pumping punches

34. 

needle nibble
needed handle

35. 

nail salt
mail sail

36. 

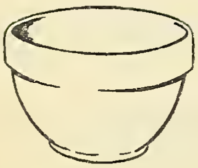
geese cherries
cheese guess

37. 

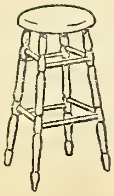
card hard
cart care

38. 

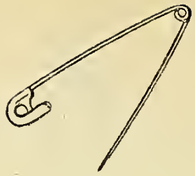
grass grapes
grind shape

39. 

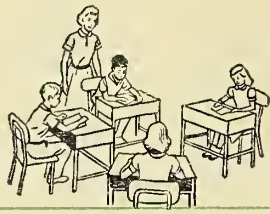
bow doll
cold bowl

40. 

stool stood
stone tool

41. 

pen pan
pin den

42. 

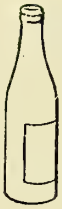
grass close
cloth class

43. 

donkey doctor
dollar double

44. 

wing swim
swing smile

45. 

bubble battle
bottle bottom

46. 

stone stamp
strong string

47. 

smoke smile
smell while

48. 

branch bridge
brings hedge

GATES PRIMARY READING TEST

TYPE PSR
FORM 3

For Grade 1 and Grade 2 (First Half)

Type PSR. Sentence Reading

BUREAU OF PUBLICATIONS • TEACHERS COLLEGE • COLUMBIA UNIVERSITY
525 West 120th Street, New York 27, N. Y.

Write your name here..

How old are you?..When is your birthday?...

School...Grade..........................Date..

This is a cat. I

This is a book. II

This is a cup. III

The girl has a book. I

The cup is white. II

The cat has a ball. III

To the teacher: Detailed instructions for administering and scoring this test are given in the Manual (included in each test package).

Number tried....................................(possible 45) Raw score (number of sentences correct)..............................

Reading grade.............................. Reading age..............................

Be sure to signal STOP at the end of 15 minutes.

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This is an airplane. I

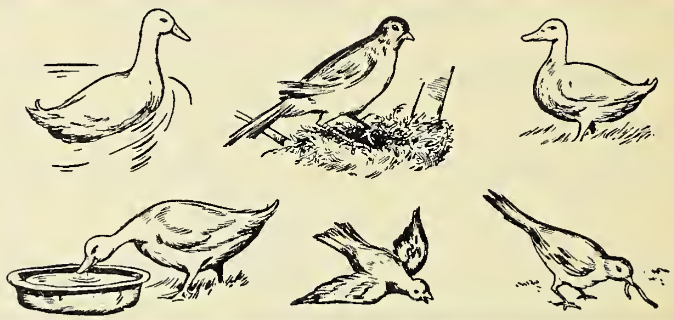
This is a barn. II

This is a spider. III

The duck swims. I

The bird flies. II

The duck drinks. III



The woman has three books. I

This is a picture of a butterfly. II

This is a picture of an elephant. III

The window is closed. I

The girl has a kitten. II

The top is spinning. III

The boy has a bicycle. I

The girl has a basket. II

The child is hiding. III

The clown is funny. I

The woman is singing. II

The squirrel has a nut. III

The child writes. I

The kitten drinks. II

The child dances. III

The teacher has a feather. I

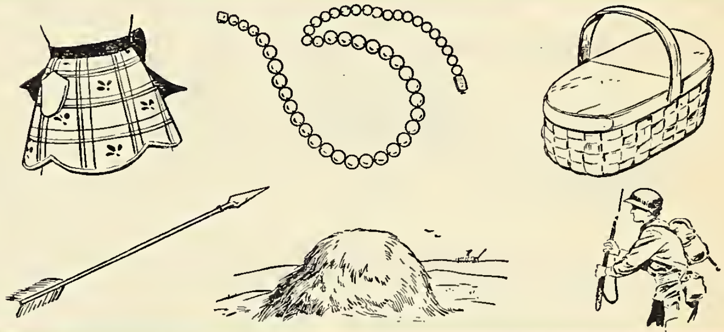
The girls like to paint. II

This fireplace is very warm. III

This is an apron. I

This is a basket. II

This is a haystack. III



The policeman has an automobile. I

The puppy is awake. II

The barrel is full of nails. III

The grocer sells fruit and vegetables. I

This is a beautiful moonlight night. II

The barnyard is near the stream. III

The princess is eating porridge. I

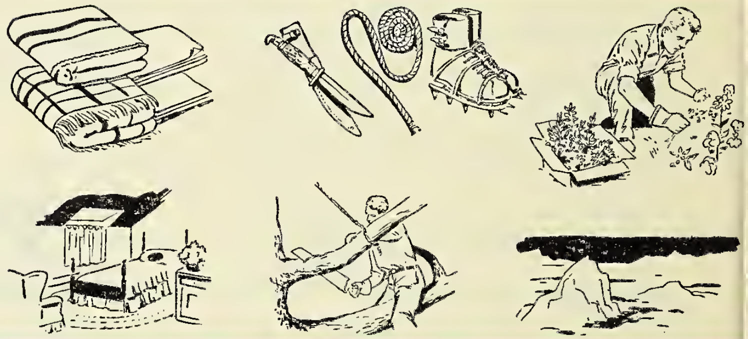
Here are the scissors and needles. II

Father is planting potatoes. III

This is an attic bedroom. I

Here are blankets and sheets. II

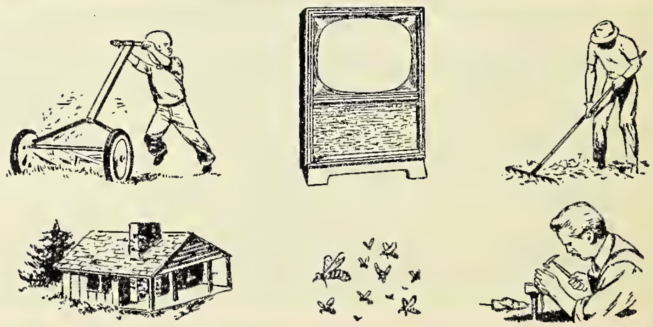
Brother is weeding the garden. III



The man has a rake. I

This is a picture of a cabin. II

This is a picture of a shoemaker. III



This is the mouth of the cave. I

The hunter shoots the wolf. II

This is a swift rushing brook. III

GATES PRIMARY READING TEST

TYPE PPR

FORM 3

'or Grade 1 and Grade 2 (First Half)

ype PPR. Paragraph Reading

BUREAU OF PUBLICATIONS • TEACHERS COLLEGE • COLUMBIA UNIVERSITY
525 West 120th Street, New York 27, N. Y.

Vrite your name here...

Iow old are you?...................................... When is your birthday?...

chool.. Grade........................ Date..

1. Put an X on the ball.

2. Put an X on the milk bottle.

3. Draw a line under the little book.

4. Draw a line from the pig to the tree.

the teacher: Detailed instructions for administering and scoring this test are given in the Manual (included in each test package).

umber tried..................................(possible 26)

Raw score (number of sentences correct)..............................

ading grade..............................

Reading age..............................

sure to signal **STOP** at the end of **20** minutes.

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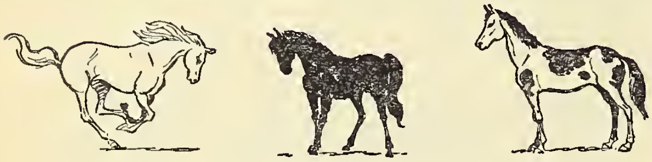
1. Put an X on the cup.

1 2 2

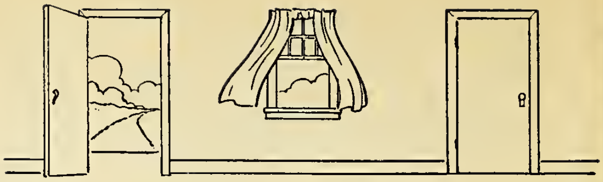
2. Put an X on the big two.



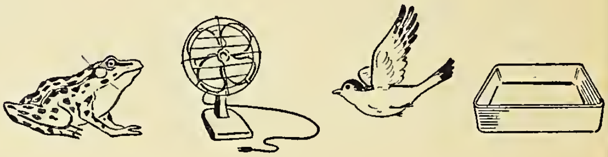
3. Draw a line under the black horse.

4. Put an X on the bird that is flying.

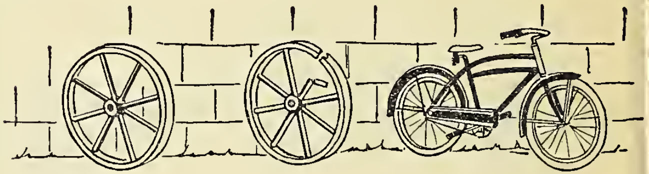
5. Draw a line under the four pigs.



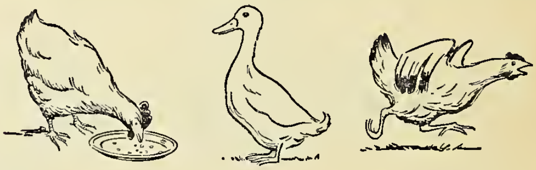
6. Draw a line under the open door.



7. Put an X on the fan.

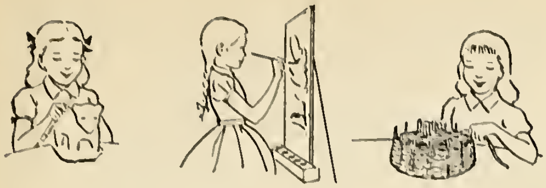


8. Draw a line under the wheel that is broken.



9. Put an X on the chicken that is eating.

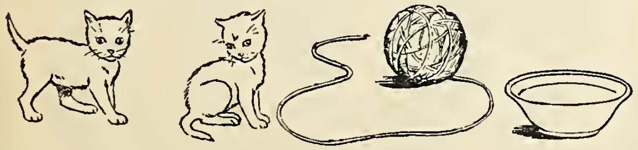
10. Put an X on the girl who has a sled.



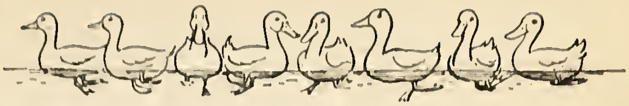
11. Put an X on the girl who is painting a picture.

12. Draw a line from the squirrel to its nest. You will find the nest in the tree on the right side of the picture.

13. The deer and the chipmunk live in the woods. The turtle lives by the water. Draw a line under the one that lives by the water.



14. A kitten likes to drink milk. This kitten is thirsty. Draw a line from one of the kittens to the milk.

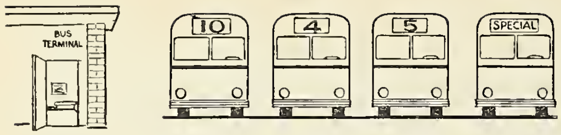


15. Here are eight little ducks. Draw a line under the feet of three of these ducks.

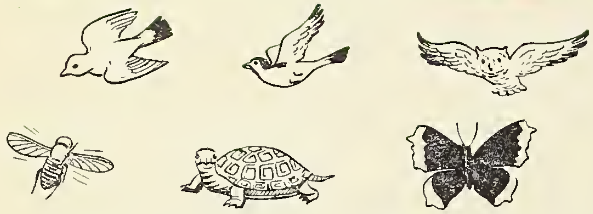
16. Chipmunks like to eat nuts. Draw a line from one of the chipmunks to the nuts.

17. These children like their art class. Some children draw, some model with clay, or paint. Put an X on the one who is modeling clay.

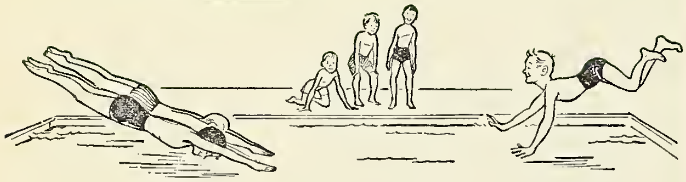
18. My brother is painting our new barn red. He is using a very wide brush. Put an X on what he uses to paint the new barn.



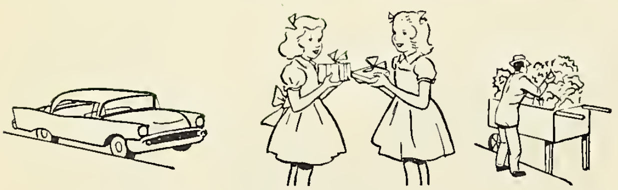
19. We were going to visit my cousin who lives in the city. She said we must take a bus marked "10." Put an X on the bus we will take for our visit.



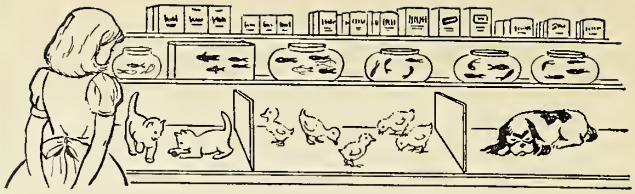
20. Bees, sparrows, robins, and owls fly through the air. Frogs, turtles, and snakes do not fly. Find a picture of something that does not fly through the air. Put an X on it.



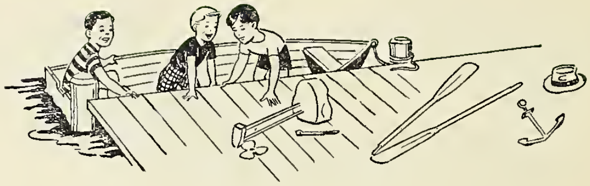
21. The swimming lesson was about to begin. The class was lined up. "Keep your head down as you enter the water," said the teacher. "Do not hold your head up." Draw a line under the picture of the way the children were told to enter the water.



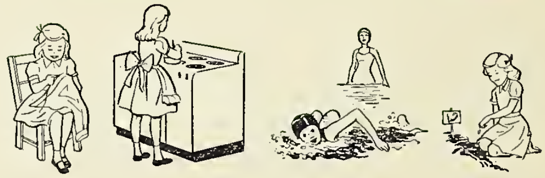
22. The girls are going to a birthday party. They are wearing their very best dresses. Each one is carrying a gift. Draw a line around the gifts they are taking to the party.



23. The little girl at the pet store window had always wanted a puppy. "Today is your birthday," said Mother. "You may choose a pet for your present." Draw a line from the girl to the pet she had always wanted.



24. The children were planning to go for a row. They are now in the boat. They will need two things to row with. Put an X on them.



25. My sister is learning to sew. She is using a needle and thread. "Take a short thread," said Mother. Put an X on the picture which shows what sister is learning to do.

26. The king and queen are going on a trip. Their children will go with them in a closed carriage. Three servants will follow in an open carriage. Put an X on the carriage in which the servants will travel.